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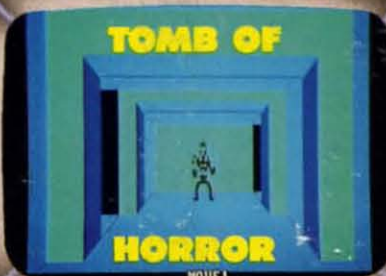
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FOR THE C-128



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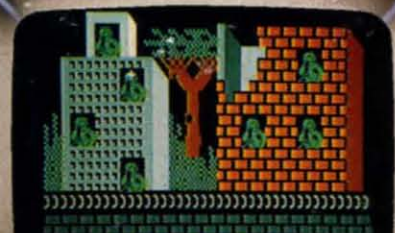


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# VIEW FROM THE BRIDGE

**W**e have several longer, possibly more significant features in this month's issue that we *could* begin this column by talking about—but to us, this month's biggest news is the return of Buck Childress with his first full-length program in six months. We join Buck in thanking the many readers who've written to ask about his progress. Happily, the eye ailment that sidelined our most prolific programmer is all but licked, and Buck's output should rise steadily in the months to come. (As for Buck's program, *Vari-Scan*, it safeguards C-64 and C-128 programmers from re-using variable names and crashing works in progress. Turn to page 30.)

After good news like that, we hope you won't find our description of the rest of the July *Ahoy!* too anticlimactic:

- As Dale Rupert points out, past *Rupert Reports* have involved connecting your computer to photo-cells, LED's, potentiometers, and relays. This month Dale helps you make the *Thermal Connection*, and turn your 64 or 128 into a digital thermometer. What's next: a Commodore-driven vacuum cleaner? Satellite dish? Roller coaster? Only time will tell. (Turn to page 32.)

- *Window Dressing* means curtains for those drab displays called up by the C-128's WINDOW command. Richard Cur-

cio's quartet of routines let you print attractive boxes and headings, manipulate text, and more. (Turn to page 37.)

- Adventure game fans registered one complaint about *Vault of Terror* (Oct. '86) and *Crypt of Fear* (Feb. '88)—their fingers were trembling so hard that they couldn't type the commands. So Cleve Blakemore designed *Tomb of Horror*, the last entry in his 3-D trilogy, to work entirely via pulldown menus. If you find yourself shaking so much that you can't wiggle a joystick, you're on your own! (Turn to page 48.)

- Mindful that some readers don't like typing in listings of 8+ pages in length, Cleve offers two games that can easily be entered in a single sitting. *Guerilla* lets you go bananas gunning down terrorists who shoot at you from the ruins of bombed-out buildings. (Turn to page 16.) And *Lunar Buggy* dispatches you on an equally patriotic mission—to recapture the stolen artifact of the Apollo space program and drive it across treacherous terrain to safety. (Turn to page 15.)

- Once you've played all three of the above and asked the inevitable question—"How does Cleve Blakemore do it?"—refer to *Programming Your Own Text Games*, in which Cleve continues to reveal his secrets. (Turn to page 13.)

- Once again, Arnie Katz and the undersigned have been chosen (along with Betsy Staples of *Atari Explorer*) to select

the programs for inclusion in this year's CES Software Showcase. We're proud to feature game reviews by Arnie and his partners, Bill Kunkel and Joyce Worley, in every issue. This month's *Entertainment Software Section* covers *Stealth Mission*, *Speed Buggy*, *Wooden Ships & Iron Men*, and *Plasmatron*. (Turn to page 20.)

- If you've been putting off looking into our *COMAL Column*, you're almost out of time. Richard Herring presents the penultimate installment in this issue. (Turn to page 45.)

In case anyone is still confused by our division into *Ahoy!* and *Ahoy!'s AmigaUser*, remember—the next *Ahoy!* for the C-64 and C-128 will be the September issue, on sale August 2. On the stands next month will be the second issue of *Ahoy!'s AmigaUser*—cover-dated August, and on sale July 5. And remember, if you're upgrading to the Amiga and want to switch your *Ahoy!* subscription to *Ahoy!'s AmigaUser*, you can—but please call 815-734-4151 or write *Ahoy!*, P.O. Box #341, Mt. Morris, IL 61054. Do not call us at our New York number with subscription problems—we can't help you from here. If you have any non-subscription questions, we'd love to help you. Call or write anytime.

—David Allikas

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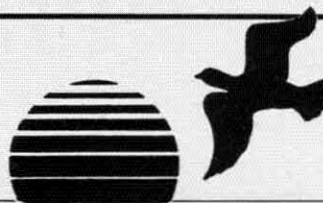
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Also new to CompuServe is a database providing detailed information, updated daily, on worldwide trade opportunities. Exporters can search the database by country, SIC code, posting date, and type of procurement.

CompuServe, 614-457-8600 (see address list, page 12).

## ILLINOIS SHOW

The third annual Chicagoland Commodore Computer Fest is scheduled for August 28 at the Exposition Center at the Kane County Fairgrounds in St. Charles, IL. National speakers and 64, 128, and Amiga vendors will be featured. Admission is \$5.00.

Computerfest, 312-897-5788 (see address list, page 12).

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IntraCorp, Inc., 305-252-9040 (see address list, page 12).

## SUPER 81 FOR THE 64

A C-64 adaptation of *Super 81 Utilities* joins the C-128 version introduced earlier by Free Spirit. *Super 81/64* will copy whole disks or files from 1541/71 drives to the 1581. The user can back up disks or files with one or two 1541's, 1571's, or 1581's, or any combination thereof. Also included are a full-featured sector editor and utilities for partitioning, scratch and unscratch, lock and unlock, rename, format, and direct DOS commands.

The program is supplied on both 5¼" and 3½" disks, and boots on either device 8 or 9. Price is \$39.95; shipping is free.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).

## PAPERCLIP PUBLISHER

*PaperClip Publisher* (\$49.95) offers all the text formatting, layout, and de-

sign capabilities needed for creating multiple-column page layouts for newsletters, flyers, price lists, menus, greeting cards, and the like. Documents up to 50 pages in length are supported. Other special features are the ability to temporarily hold and work on text or graphics outside a given document, and a "refreshing" feature that automatically updates any altered section.

Electronic Arts, 415-571-7171 (see address list, page 12).

## MUSIC SOFTWARE

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*Passport Sequence Editor* (\$14.95) allows step-editing of the MIDI 4+ and 8+ sequence files.

*Studio One Editor* (\$14.95) works with Syntech's *Studio One* program.

*DX21/27/100 Librarian* (\$14.95) stores banks and individual voices from Yamaha's 4-operator FM synthesizers.

*Generic Librarian* (\$19.95), a 32K system-exclusive recorder, works with any instrument capable of bulk Sys-Ex dumps.

SoundWare (see address list, page 12).

## CP/M STARTER SET

The PDS *CP/M Starter Set* (\$29.95) is comprised of four disks of utilities and applications for the C-128, plus printed documentation explaining booting up, transient and resident commands, and creating and dissolving library files.

Public Domain Solutions, 813-378-2394 (see address list, page 12).

## DRIVE ENHANCEMENT

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Drive Box is available through Software Support and Free Spirit.

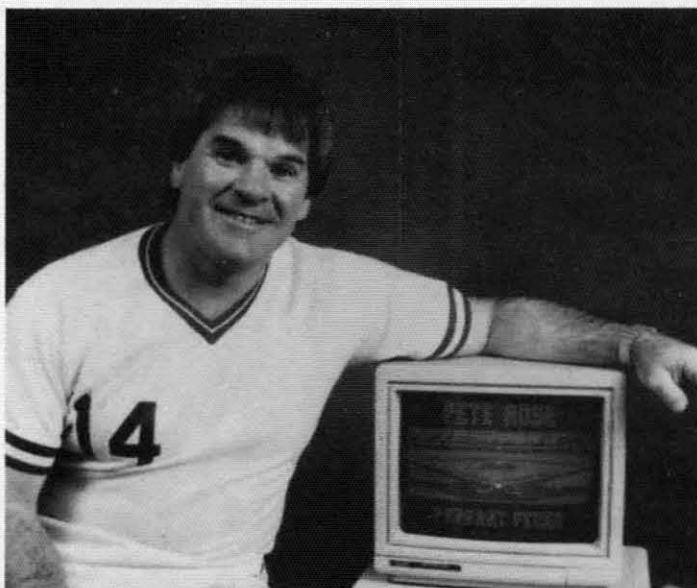
Microteq Systems, 701-232-4033 (see address list, page 12).

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Ketek, 319-338-7123 (see address list, page 12).

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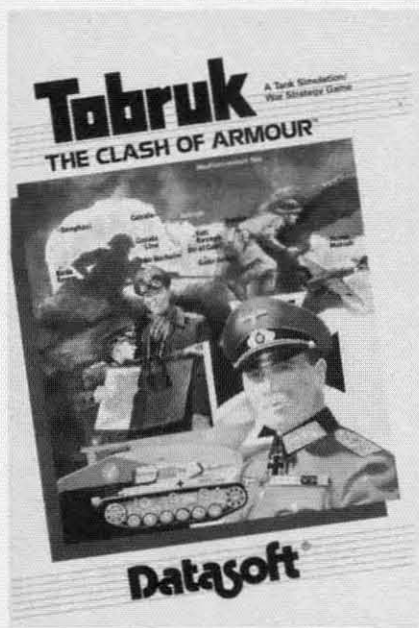
## GAMES

Scheduled for C-64 release in November, *Pete Rose Pennant Fever* lets you guide an expansion team through a 10-season, 24-team race for the pennant. Rather than looking down on the diamond from overhead, you experience the action from the perspective of one of Charlie Hustle's teammates. You pitch, hit, run, field, throw, and steal as you would on a real diamond. Managerial strategies actually employed by Rose are available. In addition, you can act as General Manager, drafting and acquiring computerized players while maintaining control of the club's finances and player salaries. Is there a collusion option? Wait and see.

Activision/Gamestar, 415-960-0410 (see address list, page 12).

Two for the 64 from EA:

Scheduled for late summer release, *Wasteland* (\$49.95) challenges players to survive in the post nuclear year of 2087. As you and your band of Desert Rangers roam the southwestern United States, trying to help other survivors rebuild and live in peace, you'll en-



**Tank's-eye view of the WWII clash.**  
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counter a cast of hundreds, including mutant villains who endanger the population. At certain points in the game, you'll be directed to the included Paraglyphs book which enhances the detail of the game and provides descriptive text. After the game is over, you may return to explore locations you were not able to the first time around.

*Patton vs Rommel* (\$29.95), designed by Chris Crawford, lets the player become either General Blood and Guts or the Desert Fox on D-Day. Each commander has numerous infantry and armor divisions at his disposal, plus a historically and geographically accurate map of 150,000 locations. 10 different kinds of tactical orders are possible, and each division can have up to 32 different orders at a time. To give orders, the players just point at a division and an objective—the army does the rest. As the strategies come to life, players can watch the battles take place, with realistic sound effects. For the C-64.

Electronic Arts, 415-571-7171 (see address list, page 12).

Rommel stars as well in *Tobruk* (\$19.95), in which you command 10 divisions of the Afrika Korps in an attempt to capture the key Libyan port city. Action can be controlled from tactical maps, or directly in land and sea battles. Players view the battle from the turret of a desert tank, with access to

machine gun controls and mines. Air tactics include ground attacks, air-to-air skirmishes, and long-range bombing. The C-64 simulation is designed by Datasoft and distributed by Electronic Arts.

Electronic Arts/Datasoft, 415-571-7171 (see address list, page 12).

*Under Fire!* (\$34.95) consists of nine WWII scenarios involving the US, Germany, and the Soviet Union, plus a construction set enabling the C-64 gamer to create more.

Avalon Hill, 301-254-9200 (see address list, page 12).

Three C-64 racing games—*Richard Petty's Talladega*, *Shirley Muldowney's Top Fuel Challenge*, and *Grand Prix Motor Mania*—have been combined into Cosmi's *Motor Racing Trilogy* (\$24.95).

Cosmi, 714-240-8985 (see address list, page 12).

*Black Jack Academy* will teach you to play the game, or help you brush up your skills. Online help explains all play options and coaches you along. Special ease-of-use features include multiple play speeds, card counting option, player card total option, money management guide, and preset multiple table rules from Las Vegas, Reno, and Atlantic City. For the 64 or Amiga; \$39.95.

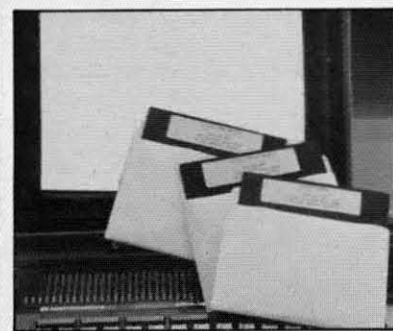
MicroIllusions, 818-360-3715 (see address list, page 12).

*Bridge Baron II* (\$39.95), an improved version, plays the complete game of bridge, allowing you to bid and play more than a billion different deals with your C-64 as both your partner and your opponents. New features include two-person mode, rubber bridge scoring, automatic play mode, Baron's recommended bids and plays, the ability to claim or concede tricks, simplified card play, weak 2-bids, and the option to save deals to disk.

Great Game Products, 800-GAMES-4-U (see address list, page 12).

## MORE CP/M

Poseidon has published the spring '88 addendum to its catalog of CP/M software, priced at \$1.75 plus a 45¢ SASE (if paying by check, it must be made out to Ralph Lees). New software prices are \$16 for the first disk, \$12 for the second, and \$7 each for all subsequent ones.



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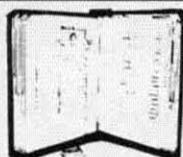
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### SWEEPSTAKES

Computer Learning Month has launched a School Certification Program and Sweepstakes, with a first prize of a computer and software and 30 second prizes. To become eligible, teachers in grades K-12 must use three software programs they have not tried

before between August 1 and October 31. Further details are available from CLM, an official project of the Software Publishers Association.

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### PAINT PROGRAM

The **Masterpiece** graphics package (\$29.95) lets the C-64 artist move, copy, scale, rotate, twist, and fold the onscreen artwork. Other features include picture compression for saving memory, and the ability to load pictures from BASIC.

Scorpion, 201-663-0202 (see address list below).

### GOOD NEWS

P.A.V.Y. has lowered the price of **Landmark, The Computer Reference Bible** from \$164.95 to \$129.95. If you're reading these words before June 1 (as only subscribers are likely to be), you may still be able to get in on P.A.V.Y.'s limited time special price of \$119.95

*Continued on page 81*

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# PROGRAMMING YOUR OWN TEXT GAMES

## Part II of III: Think Modules!

By Cleveland M. Blakemore

**I**ngenuity lies not in further complicating definitions and concepts, but in reducing the number of contradictions and terms to the fewest possible true sets. Any given system design must begin with the sum of its parts, and then define these parts.

This is the essential theory behind "black box" system design, or modular programming. We begin by describing what we want the system to do, then breaking this idea down into the necessary steps to accomplish it. Whether you are pursuing a personal goal or creating a computer program, you will find that this approach is always the most effective.

Last month we published a short text adventure called *Lost Dutchman's Mine*. In this installment we will examine this program in detail and demonstrate how a series of modules (or subroutines) can be tied together into one cohesive system that is greater than the sum of its parts. None of the routines by themselves would constitute a game—but working in tandem, they create an interactive adventure.

If we wanted to describe the player's purpose in *Lost Dutchman's Mine* in one sentence, we could say:

"To move around within a network of locations, collect various objects, return them to a specific location, and win the game."

This is the simplest way to define the program's operation. In last month's column, I advised designing your adventure on three separate pieces of paper before touching the keyboard. Page one of my scenario for *Lost Dutchman's Mine* read like this:

"The object of the game is to wander around within a series of caves, collecting up three treasures as you go. When you have all three objects, you return them to a specific base location, drop them, and win the game."

On page two I listed the obstacles I wanted to hamper the player's efforts:

"1. A timber wolf guards the entrance to a burial mound where one of the treasures is buried. The player must find the gun and bullets to kill the wolf.

"2. A secret word is required to pass from the base location to the caverns. (Kind of like PLUGH in *Colossal Caves*.) The secret word is written inside a matchbook cover.

"3. A whistling spirit guards the entrance to the caverns. The player must blow on an empty 7-UP bottle to scare the spirit away.

"4. The burial mound is submerged under water. The player must find and open a reservoir lock through which the mound room can be drained.

"5. A shovel is needed to dig up the third treasure (Dutchman's nugget).

"6. The player must also light a torch, drop enough equipment to fit through a narrow crack, and escape from the room after he opens the reservoir lock."

You may have noticed that a lot of these ideas are taken from other adventure games, many of them classic puzzles. I wanted them to be familiar enough that the game could be solved without too much trouble. I could just as easily have made the game much harder.

On the third and final page, I drew a map detailing all nine locations in the game, complete with references to the objects that would be found there, and the various puzzles specific to those spots.

Using the modular approach, I broke the program down into seven discrete boxes.

1. Initialize arrays and variables
2. Read in data
3. Get command
4. Find verb in command
5. Find noun in command (if any)
6. GOSUB to appropriate subroutine pertaining to verb
7. Data lines

Modules 3, 4, and 5 could all be considered part of the parser, the routine that gets and analyzes player input. I define them separately here to make it clear what goes on inside the routine.

The first thing I typed in, as always, were lines 1530-1610. These lines contain descriptions of the nine locations in the game. I immediately followed with comments to accompany each, in lines 1630-1670. These comments are specific observations in each location. For example, the gas station has a "metal plaque above a glass shelf."

Then, using the third page of my notes (the map) as a

guide, I typed in the data for an array of nine dimensions, each dimension having six elements. This dimension will be known as D(9,6). The six elements consist of the directions North, South, East, West, Up, and Down. This is a numerical array, and the number in each element indicates the location to which that direction connects. Any non-zero number is a pathway; otherwise there is no exit in that direction. I did not type in directions for the gas station, because it is only accessible by use of the forementioned "magic word."

In the fashion of any sensible hacker, I jumped to lines 120 through 210 and designed a data loader. Once I made sure that the arrays were dimensioned properly in line 120, I read them in a couple of times in lines 190 and 210 just to make sure everything was going smoothly before I continued. This type-n-run approach is the hacking method, and it works. Trust me.

Now for the tough part. I had to figure out all the verbs and nouns that would be needed for the parser's vocabulary. In lines 1800-1850 I tried to give the program a reasonable dictionary of words to work with for player input. An advanced parser would recognize far, far more than this simple collection of words.

Again, I skipped back to the beginning and made sure these strings loaded in correctly before going on.

Lines 1870 through 1900 are detailed descriptions of the objects that can be carried in the player's inventory. Although an object might be referenced by the parser as "diamo," it will be described on the screen as a "glowing diamond." This gives character and atmosphere to the adventure.

Line 1920 is a list of numbers that tells the program where to place objects initially. The first number indicates the location, the second is the object number itself in the inventory. The -1, -1 at the end of the line signals the end of the data.

Lines 1940-1970 are end of game messages, for when the player is killed or is victorious. If the player is killed, these lines help tell him where he made his mistake.

With this, I completed the data lines, the major stumbling block of any adventure game. Although I made many changes afterwards and altered these lines considerably before finishing, these lines gave me something to work with, the meat of the text adventure. The remaining program portions manipulate the data loaded in from here in many ways, but it is in these lines that the game gets its substance.

Important variables to be defined are CL (Current Location) and the arrays O(9,8) and I(8). The former is an array that tells what objects are in what rooms, and the latter is the player's inventory array. I(8) refers directly to the eight objects listed in line 1840, the objects in the game which can be carried. Any non-zero number in element I(1), for example, would indicate that the player is carrying the torch. However, a -1 would mean the torch is burning, while a 1 would mean it is out. I also set up meaningful flag names in line 150. These flags indicate the status of certain items.

In lines 340-540, I fleshed out the parser routines. First the directions, then once the program is recognizing them correctly and responding, I introduce the other verbs. It is better to make sure that all the directions are functioning correctly first before continuing, because a flaw that shows up later might take a lot of work to repair. Make

certain that the directions in the game correspond identically to your map. It is very common to make errors here. I often get East and West mixed up while typing them in.

Line 340 gets the player's input. If he enters nothing, the program checks again. Line 370 checks for a single character input (either a direction or the letter "i" for inventory) and acts accordingly. Since the six compass directions match up with the six single character commands perfectly, I just reduced any of these terms to a number between 1 and 6, subtracting 7 if necessary. I can then use this number to reference the corresponding element in direction array D(9,6). Once a match is found for the verb, the number is placed in the variable V.

The verb is the important part. We use the verb to jump to the subroutine that designates the action, so we must have a verb. The noun, on the other hand, is not always necessary for many actions, and so our parser only looks for it. If it finds one, it places the number of the noun into the variable N before branching off to our routine. The subroutine can then check this variable to see if the player is referencing the correct object. For example, if the player gives the command to dig, we check the variable N to determine whether or not he wants to dig in any particular spot, as in DIG MOUND. If N=0, we simply print a standardized message that reads "YOU DIG FOR A WHILE BUT YOU DON'T FIND ANYTHING."

After the parser has both these variables, V and N, assigned with values, it drops through to lines 570-580, the branches. These lines will steer the program flow into the correct verb actions that alter program variables and the game environment.

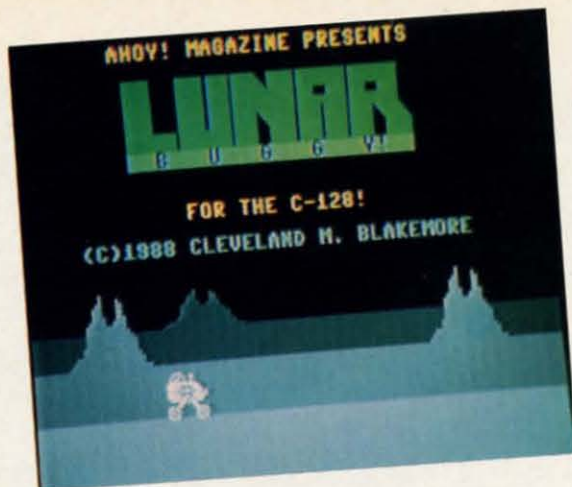
These lines run from 700-1520, accomplishing every possible action that the player is permitted to take in our adventure. If you study them carefully, the variables are self-explanatory and it should be readily apparent that they act on values to change location inventory, specific flags (mound full-empty, wolf dead-alive, etc.), and print messages for the player's benefit.

After program flow returns from these subroutines, the main parser program executes a series of critical checks in lines 600-690. These flags count elapsed time in the current location and check on the player's status relative to certain non-player characters and events. For example, if the player is in room 4 for more than four turns with the spirit, he is going to get it good. The same goes for being in a river full of water too long or beside a hungry wolf.

The check for a win is in line 600. This line checks if a variable called WINGAME has been set yet by the drop subroutine. If the player drops all three treasures in location zero, this flag will be set upon returning from the routine, telling the main program that the player has succeeded.

With as little work as all this, an adventure game was born. We have a full-fledged story, with a plot, characters, and suspense. Next month, we'll go over the specifics of the way the parser functions, and methods we could use to upgrade the routine so that it could recognize complete sentences.

Until then, remember—stop wrestling with the program as a whole and break it down into modules. You cannot move mountains unless you do it one bucket of dirt at a time! □



In the year 2009 A.D. it was discovered that a colony of extraterrestrials had established itself on the dark side of the moon. A Russian installation was attacked and totally obliterated in 2011 when it attempted to approach the alien base to make contact. Following that incident, a United Nations security resolution placed the aliens' location off limits to all international teams until further notice, for fear of antagonizing the otherworldly visitors.

You are a government agent assigned to a secret mission of the highest priority: to recover one of the greatest of all historical artifacts, the Apollo lunar buggy. If you can drive the vehicle over the treacherous lunar plain and past the alien forces, the buggy can be returned to the Smithsonian Museum for posterity. It seems like an impossible gamble,

but you know it will be worth it if you can recover this national treasure.

*Lunar Buggy* is a jump-and-shoot game similar to *Moon Buggy*, an arcade favorite. It requires a joystick in Port 2. Press the fire button to escape from the title screen.

This game for the C-128 features a background that smooth scrolls past at two different speeds to give the illusion of depth. You've probably seen it before in many arcade games. Lunar mountains pass in front of one another as they move, with the smaller and slower moving terrain in the rear of the display.

To jump, you push up on the joystick. Press the button and push either up or right to fire a laser torpedo. You can jump and fire at the same time if necessary.

The alien ships are a mere nuisance at first, but they can become a real threat later on in the game as they begin to move erratically and with greater speed. Destroy them as quickly as possible, but don't let them distract you from jumping over the many craters in the lunar surface.

Each time you go 500 miles across the moon towards safety, you'll pass an American outpost. These small bases provide short stops to rest and refuel before moving on.

The alien ships are worth the current base number X 100 points each.

If you manage to go 5000 miles in *Lunar Buggy*, you'll have escaped safely and returned the buggy to American soil, where it belongs. □

SEE PROGRAM LISTING ON PAGE 67



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By now you've probably seen all the ads for all the different "Super Cartridges" on the market. And they can talk all day, but let's get real: no cartridge is going to back up 100% of anything, no cartridge is going to turn your C-64 into an Amiga, and no fancy screens or hyperbolic claims are going to give a cartridge any more power than it really has.

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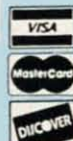
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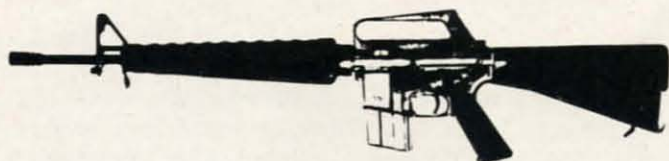
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# GUERRILLA



## For the C-64

By Cleveland M. Blakemore



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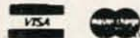


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GOOD SHOOTING... AND GOOD LUCK!

---END OF MESSAGE---

**W**e've never published a really gung ho military game in *Ahoy!*, so I figured it was time to do one. In this short and sweet BASIC-ML hybrid program, you fight off a communist horde who are launching a massive assault on your location. As they appear in the windows of the bombed out ruins on the other side of the stone wall of your fortress, you attempt to shoot them before they can get a bead on the wall with their LAWs (Light Antitank Weapons). If you are too slow, they fire a rocket which blows away a portion of the wall. The resulting damage is registered on the red bar at the bottom of the screen. When this bar vanishes, the fortress has been overrun.

The game uses a joystick in Port 2. The white cross represents your aiming point. Center this on a soldier as he appears in the window and press the button. If you hold the trigger down, the gun will fire continuously. This is very unwise, however, because you only have four boxes of ammo to begin with, and when they are used up, you're at the mercy of the GREEN aggressors.

The game has four different attack waves, with complete havoc breaking loose on the fourth one. Soldiers will be popping up in every window and firing everything they've got left to try to destroy the fortress. If you manage to survive this last attack, the RED army will be victorious over the GREEN forces. Otherwise, you'll end up reading propaganda and growing potatoes.

The soldiers are worth 150 points apiece, multiplied by the number of the wave. Any score over 70,000 is good.

It's very difficult to repel the GREEN forces. They're mean. They're hateful. They cross the street against the light. They've got tons of overdue library books. Just last week, they killed Rambo by inserting bullets into his body manually.

Good luck! ☐ SEE PROGRAM LISTING ON PAGE 70

# IT TAKES A LOT TO IMPRESS ME.



**BRIAN DOUGHERTY**  
*Software Designer/CEO*  
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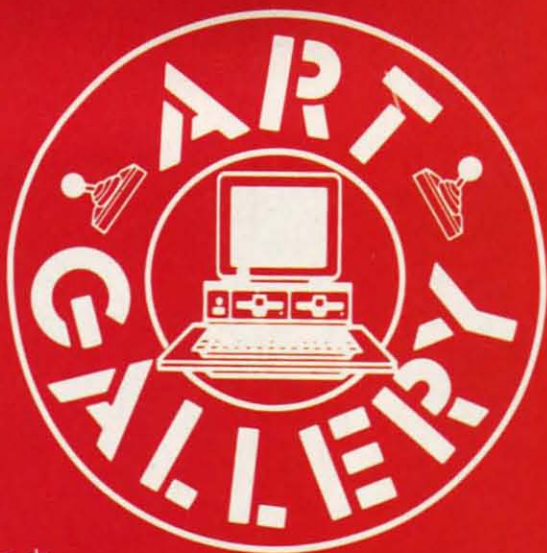
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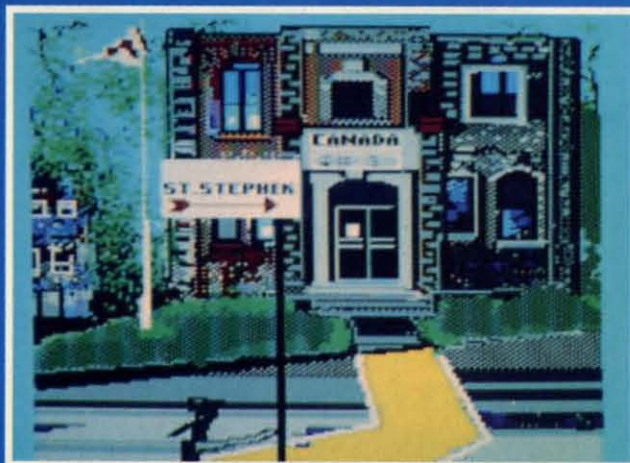
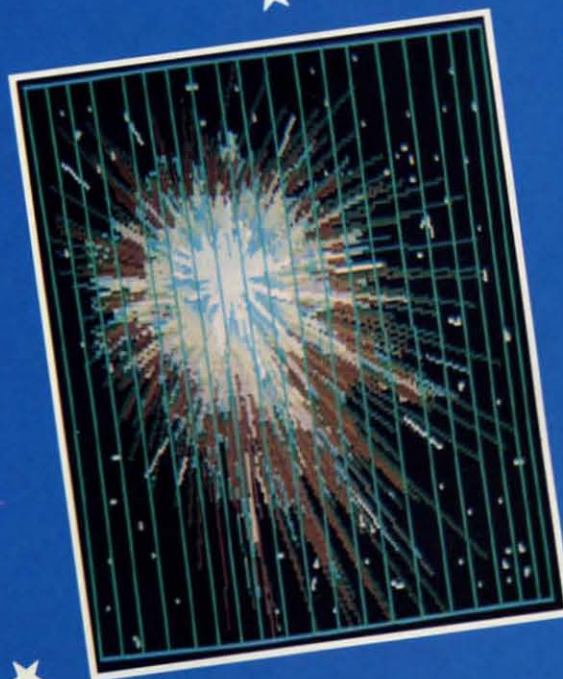
The *Ahoy! Art Gallery* offers the opportunity for fame and fortune to aspiring Commodore artists. Send your work on disk to *Ahoy! Art Gallery*, Ion International Inc., 45 West 34th Street—Suite 500, New York, NY 10001. Indicate the drawing package or file format of the images. Graphics produced on the Amiga are eligible for inclusion in *Ahoy!'s AmigaUser*; C-64, C-128, and Plus/4 images are eligible for inclusion in *Ahoy!* If your image is published, you will receive a free one-year subscription. Current subscribers will have their subscription extended by one year.

Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director, based solely on their artistic merit.





Irony of ironies — only two Americans are among the contributors to this month's 4th of July edition of the *Art Gallery*. (Although, as the old joke goes, they have a 4th of July in other countries — they just don't celebrate Independence Day.) At left are two treatments of *Presidents' Day* — traditional and punk — by Michael Mikottis (Berwyn, IL). Above is *Marching Band* by Heinz Diekert (Vernon, BC), pounding out "Stars and Stripes Forever" just as surely as mom made little green apple pie (or something like that). At right is an unforgettable *Reagan* by Alberto Valsecchi (Milano, Italy), *Fireworks* by Tom Kane (Buffalo, NY), and *Post Office* by Robert M. Ellis (LaSalle, Quebec). True, it's a Canadian post office. But where would our neighbors north of the border be without the American Revolution? Still trapping furs, no doubt, and trading them to us for three-cornered hats and powdered wigs. Here's wishing all our readers a safe and enjoyable holiday.



## PLASMATRON

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**Commodore 64**  
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*Plasmatron* is a perfect example of what can only be called "generic entertainment software." These generally well-executed but hackneyed game programs are produced in Europe and sold in the U.S. by mainstream publishers. Often the American publisher uses a "discount" label name. In this instance, the Avantage banner signifies Accolade's lower-priced software.

European programmers grind out these rehashes of arcade "standards" like sausage. Games which should be the result of a creative process are instead formulaic and predictable.

On the other hand, as with all generic product, the user knows what he's getting and he gets it at a good price. The entertainment is based on play mechanics that are already proven successes, and the lower price gives gamers a chance to acquire playware at bargain rates.

*Plasmatron* is just such a piece. Originally produced by The Zen Room and brought to these shores by Avantage, it's a horizontally scrolling science fiction shootout set against a variety of scrolling backgrounds. The user pilots a Plasmatron fighter, a futuristic combat aircraft, over the planet Loughton 2, encountering fierce resistance from hostile forces. (Unfortunately, the skimpy instructions never specify whether these "aliens" are native to this world.) The objective is to blow up as many ships and other targets as possi-

ble, then make it back to base before the limited shields are exhausted.

The enemy ships in the initial attack wave are sitting ducks, but before long the opposition stiffens. Then the player is up against giant insects, floating asteroids, and multicomponent fighter ships which take up to five hits to eliminate completely.

The only remotely original aspect of *Plasmatron* is its visual presentation. At first look, it *seems* to be the familiar side perspective seen in earlier games like *Defender* (Williams) and *Super Cobra* (Stern). The designers, however, actually "tilted" the lower part of the landscape and added the Plasmatron fighter's shadow to help manufacture a 3-D look. This is a purely cosmetic innovation that has no impact on the game whatsoever. But when it comes to generic software, one takes one's innovation where one finds it.

*Plasmatron* offers simulated three-dimensional graphics, but the inspiration for this pseudo-3D seems to be the old View-Master slide viewer system. When you looked into a View-Master, the world indeed had dimension, but only as a series of spaced backdrops. These backdrops were flat, like two-dimensional stage scenery. That's how *Plasmatron* looks. There's a horizon line about a third up the display area with backdrops slotted in sequence to create the illusion of depth.

The playfield also includes a console which displays the status of the ship's shields, damage, ETA, and lives remaining. It's difficult to speculate about the purpose of a damage reading on a

## Featured This Month:

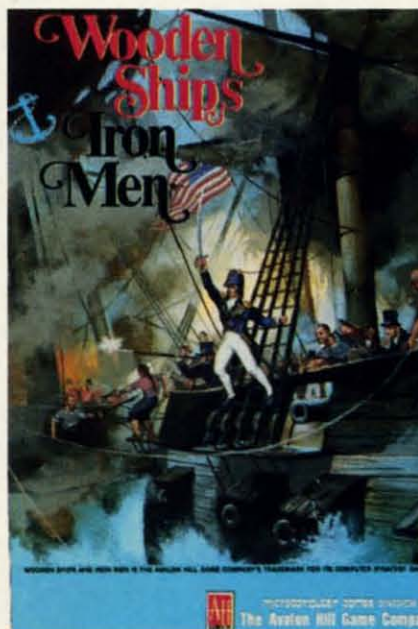
Plasmatron .....	20
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Speed Buggy .....	23
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ship which is destroyed as soon as its shields run out, especially since the instructions never even mention that there is a console! Damage is accumulated, however, even while shields remain intact, but the game plays at such a high speed it isn't possible to determine how it is being accrued. Current score and high score displays flank the console.

*Plasmatron* has some nice graphics and an original look, but there's nothing else here that hasn't been seen hundreds of times already.

Avantage/Accolade Software, 20863 Stevens Creek Blvd., #E, Cupertino, CA 95014 (phone: 408-446-5757).

—Bill Kunkel



For the hard corps computer wargamer.  
READER SERVICE NO. 152

## WOODEN SHIPS & IRON MEN

**The Avalon Hill Game Co.**  
**Commodore 64**  
**Disk; \$35.00**

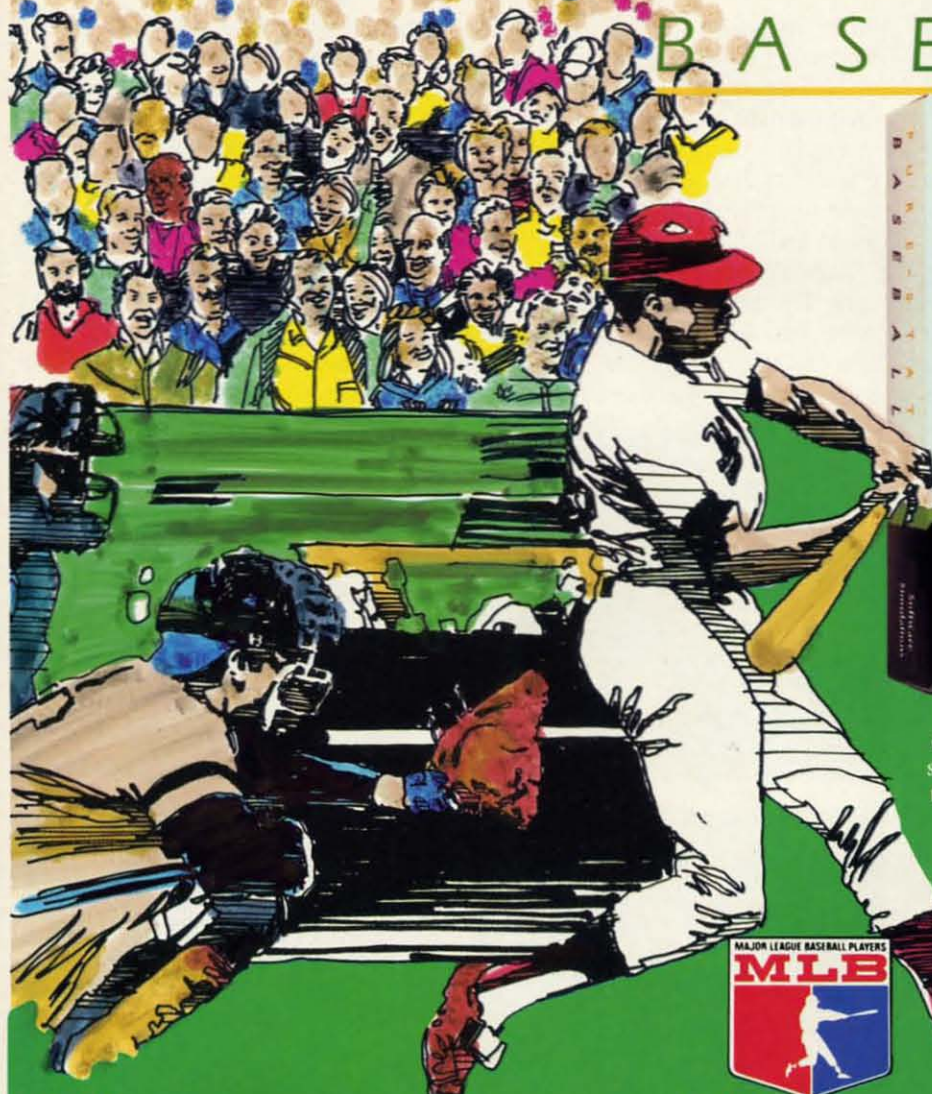
Transferring a military simulation from the tabletop to the computer screen is always a chancy undertaking. Avalon Hill, which has a board game catalogue full of non-electronic classics, has tried numerous times with varying results.

Plasmatron's only somewhat original aspect is its visual presentation. The lower part of the landscape is "tilted" to help manufacture a 3-D look.

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### Wooden Ships has few computer frills.

When S. Craig Taylor, Jr. unveiled the original edition of "Wooden Ships & Iron Men" under the Battleline Games imprint, strategy gamers hailed it as the greatest simulation of naval combat during the age of sail. Time has scarcely dimmed its reputation, so the release of the home computer disk ranks as one of the year's most important electronic gaming events.

Programmer Jim Jacob has executed a fairly literal translation of the board game. As a result, the Commodore edition of *Wooden Ships & Iron Men* makes virtually no use of the unique advantages of the computer. The sound is minimal, the graphics vaguely ape the counters and map of the board game, and gameplay is quite similar to Taylor's original creation.

If Jacob has transmitted the limitations of the board game to the computer version undiluted, the same can also be said of the simulation's strengths. The computerized *Wooden Ships & Iron Men* features the same wealth of detail, historical accuracy, and lively gameplay as its cardboard inspiration.

The main display of this one- or two-player contest is divided into two sections. The upper portion is a scrolling map with a movement grid. Each ship occupies two adjacent hexagons. Although the drawings are not especially detailed, players should have no trouble distinguishing friend from foe.

The lower portion of the screen presents option menus, ship status reports, and results of combat. The computerist employs the joystick to choose orders from menus and confirms them with a press of the action button. The program automatically puts a joystick-controlled cursor on the map when the player needs it for specific movement and firing commands.

Like most Avalon Hill creations, *Wooden Ships & Iron Men* subdivides

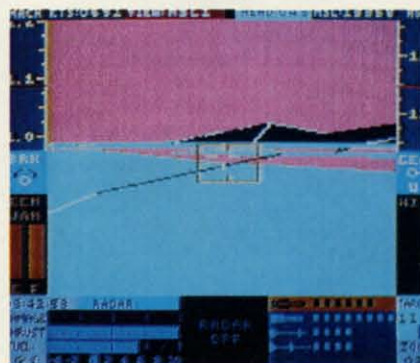
turns into phases for ease of play. The sequence for a complete turn consists of the following phases: wind changes, unfoul tangled ships, movement, drop or raise anchors, grapple with nearby ships, boarding preparation, combat, melee combat and crew transfer, reload guns, and change sails.

Although this list of procedures hints, correctly, that this is one complicated game, it's really not so daunting taken step by step. A mammoth 56-page manual contains exhaustive tutorials on

both the routine of play and the construction of customized scenarios.

The ability to create additional battles is a great feature, especially for the naval historians among us, but the prepared scenarios are of paramount importance to most gamers. *Wooden Ships & Iron Men* really shines with 25 engagements drawn from the period from the American Revolution to the War of 1812.

The variety is incredible. The battles range from ship versus ship slug-



*While Stealth Mission boasts remarkably accurate cockpit displays, its emphasis is on flight and combat elements.* **READER SERVICE NO. 153**

Speed Buggy offers five tortuous courses, all utilizing big rocks, wooden fences, and brick walls in various combinations as obstacles. **READER SERVICE NO. 154**



festivals like Constitution against Insurgent to huge multiship actions like the Battle of the Nile and Trafalgar. Most of the battles involve vessels from the US, France, and Britain, but there is some use of lesser powers like Spain and Venice when history so dictates.

For all its outstanding qualities, *Wooden Ships & Iron Men* appeals most strongly to hard corps computer wargamers. It minutely duplicates the board game, but does not add many of the trimmings non-wargamers have grown to expect from their software. Those who want an uncompromisingly authentic recreation of this colorful period in naval combat could well find a new favorite program once they set sail with *Wooden Ships & Iron Men*.

The Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214 (phone: 301-254-9200). —**Arnie Katz**

## **SPEED BUGGY**

**Data East  
Commodore 64  
Disk; \$29.95**

To paraphrase an old saying, "God must love driving games. Otherwise he would not have made so many of them." It sometimes seems as though there's a new one every month, each only microscopically different from those which preceded it.

*Speed Buggy*, the latest title in this genre to reach market, breaks out of this automotive rut. It provides a totally original gaming experience that could never be confused with the sports car and race car simulations.

The gamer employs the joystick to control a four-wheel off-road vehicle. It turns on a dime, accelerates rapidly and, best of all, can skim along on two wheels if the player drives over one of the rocks which the designer has planted so helpfully in the middle of the road. After hours behind the wheel of electronic Indy cars and Corvettes, it's quite a shock to see the buggy launch into the air and sail over road obstacles.

The control scheme is simplicity itself. Moving the stick to the left or right governs lateral motion, slamming it forward puts the pedal to the metal, and pulling it back applies the brakes. The action button shifts between high and low gears. A rudimentary control

panel in the upper right quarter of the screen presents all pertinent data, including the speed, lap number, current gear, and elapsed time.

The disk provides five tortuously twisted courses. The easiest is called "Off road," possibly because it has more hazards than the other four, which are labeled "North," "South," "East" and "West." Each has extensive scenery themed to its name. For example, "South" is a symphony of palm trees, sandy beaches, and pastel colors. All five utilize big rocks, wooden fences, and brick walls as the major obstacles, but the combinations vary greatly from course to course.

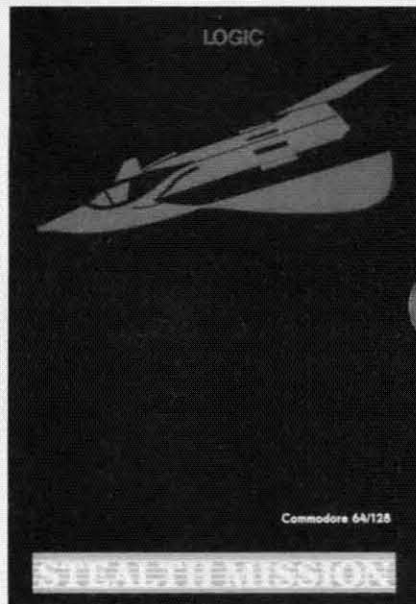
*Speed Buggy* is a race against time. The vehicle must pass the finish line before the countdown clock reaches zero. If the buggy navigates the entire course fast enough, the player earns the right to try another lap. The hazards are positioned differently for each lap, so there is pleasing variety even for the most skillful drivers.

The scoring system might dampen the spirits of a few novice drivers. Completing that first lap causes a tremendous increase in total score for most players. It is common to leap from a total in the 7000-8000 range to 30,000 in a single race just by beating the first time cutoff. So, until the computerist leaps that hurdle, be prepared for point totals to stay fairly static from round to round.

Like many other Data East productions, *Speed Buggy* bears the telltale traces of insufficient attention to detail. The program itself is fun and highly playable, but all the little things which enhance the gaming experience are either wrong or missing.

The implementation of the vanity board is a perfect example. Because *Speed Buggy* was obviously programmed for use with a tape drive, the disk does not retain high scores once the computer shuts down. There is no reason why this could not have been corrected before American republication. The same goes for the ludicrous title screen. It calls the game, presumably in an English transliteration of the original Japanese, "Buggy Goy." Insert snickers and ethnic jokes here.

Fortunately, none of these trivial flaws directly impacts the gameplay of *Speed Buggy*. It is tons of fun and a



*Included among Stealth Mission's eight scenarios are a mountain conflict, a battle at sea, and a bomber marathon.*

terrific addition to the Commodore 64's library of driving games.

Data East, 470 Needles Dr., San Jose, CA 95112 (phone: 408-286-7074).  
—**Arnie Katz**

## **STEALTH MISSION**

**SubLOGIC  
Commodore 64  
Disk; \$49.95**

*Stealth Mission* is a new flight simulator from SubLOGIC. Roll it around in your mouth and say it again: "a new flight simulator from SubLOGIC." Sounds great, doesn't it?

SubLOGIC, in the person of Bruce Artwick, virtually invented flight simulation for microcomputers earlier in the decade. The original *Flight Simulator* (for the IBM PC) and the subsequent *Flight Simulator II* (other home systems) set the standards that dozens of other publishers spent years struggling to surpass. Secondary software, meanwhile, in the form of *FS Scenery Disks*, lets users take off and land their small aircraft anywhere from Chicago to Tokyo, and all points in between.

A few years later, SubLOGIC again blew the whole scene apart with *Jet*. This advanced simulator allows users to climb into the cockpit of several modern combat fighter jets and engage in mach-speed dogfights, aerobatics (stunt flying), and land on the deck of

*Continued on page 51*

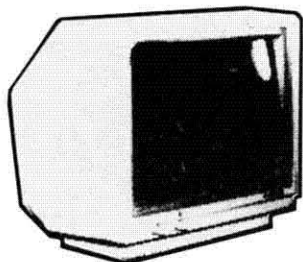
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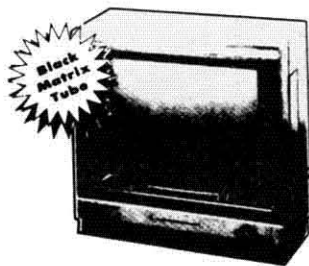
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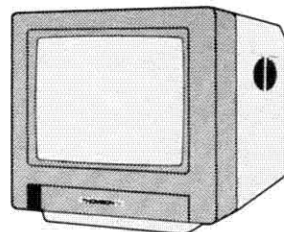
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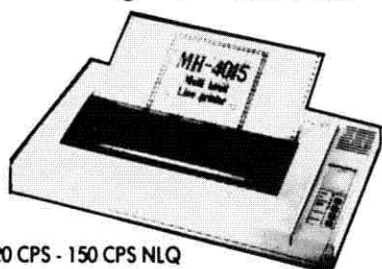
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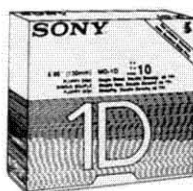
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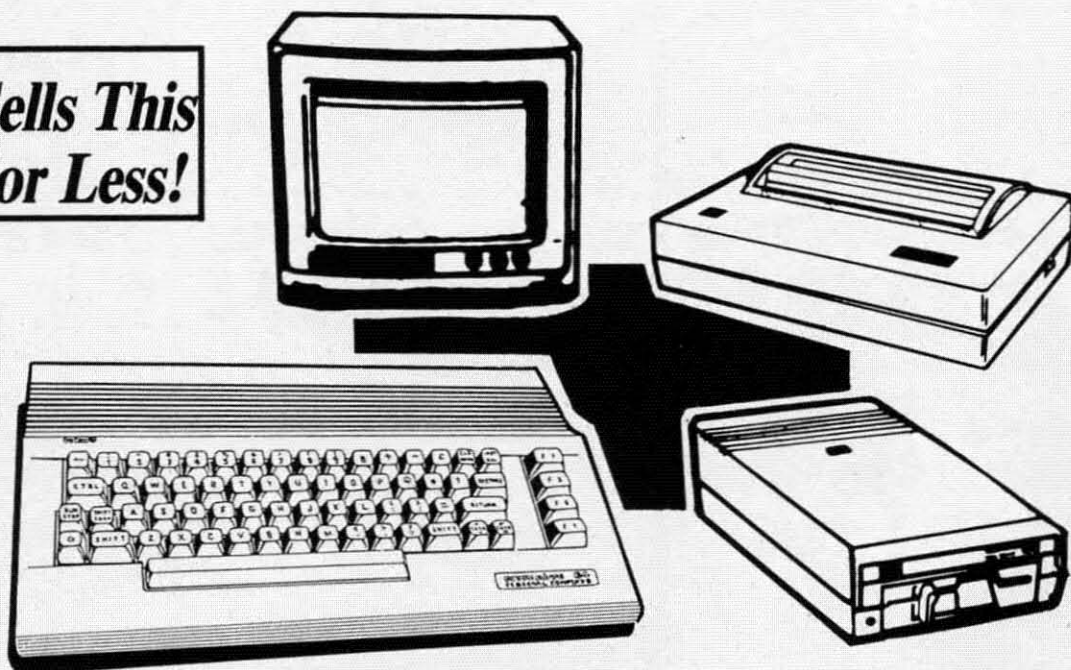
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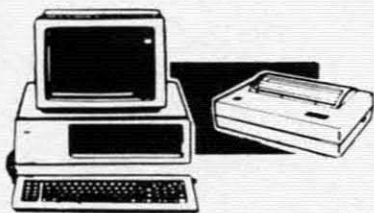
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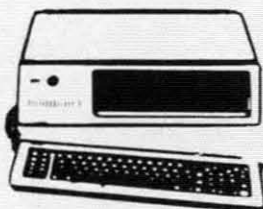
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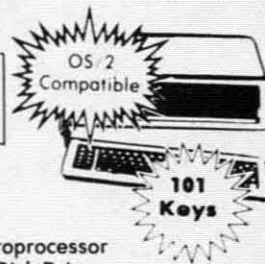
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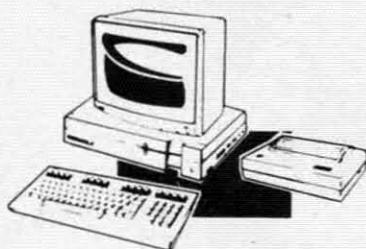
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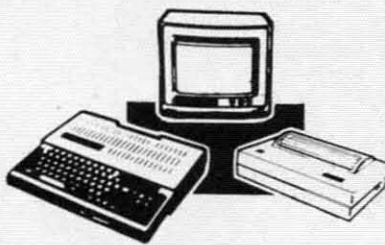
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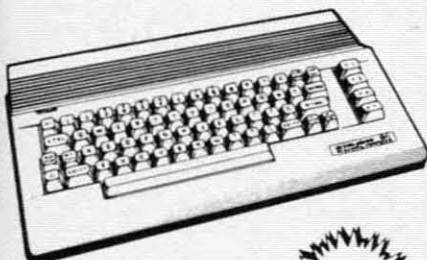
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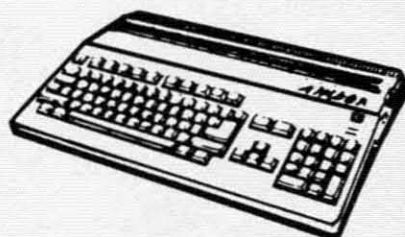
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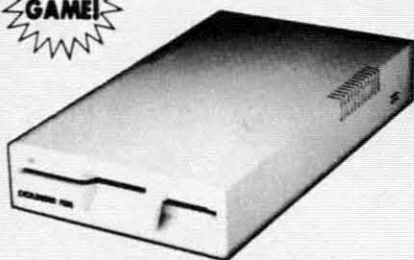
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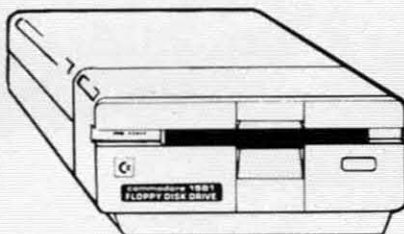
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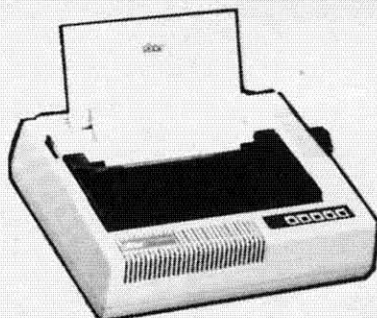
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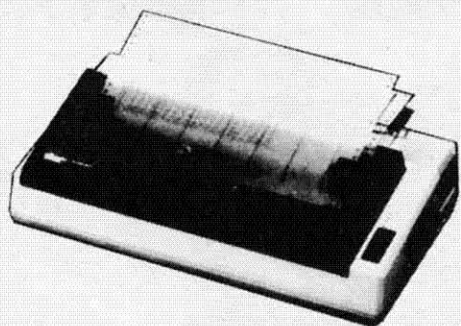
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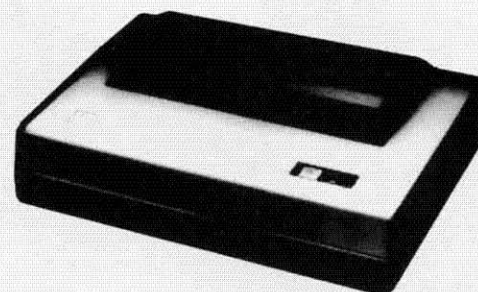
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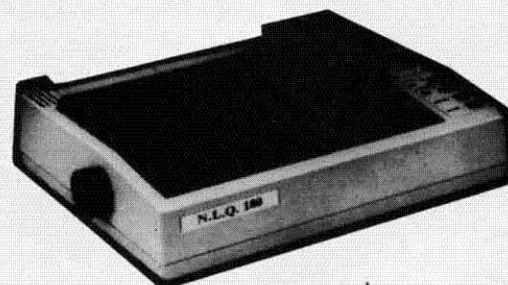
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# VARI-SCAN

## For the C-64 and C-128

### By Buck Childress

**W**ell people, I'm about to hand down a secret recipe for the best RAM chip soufflé this side of Pluto. Just add a head full of frustration, a dash of space bar, and a couple of cursor keys to taste. Mix well, then jump up and down on Ol' Reliable till your anxiety is overtaken by grief. Heck, you've just hurled your trusty companion up to that Great Microchip in the Sky.

Of course I'm just kidding...I think. At any rate, we all get overwhelmed by frustration from time to time. After all, *some* of us are only human. Well, I suppose an explanation is in order.

Variables (or should that be frustration-ables?) have got to be one of the biggest contributors to premature hair loss, fried brain cells, and unintelligible babbling amongst computer programmers. Have you ever been in the process of writing a program, added a new (or so you thought) variable to the list, and then watched in total disbelief as your masterpiece took a nose dive? Shucks, if you'd only known that not-so-original variable was in there, you probably wouldn't be dangling from the ceiling right now. Why don't we get you off that ceiling (how are you going to explain the footprints to the landlord?) and lower the old blood pressure a bit. Maybe with a little bit of practice you'll be able to talk again. As for me, my brain cell just multiplied. With some luck both of them might do it again. Then I'll have four.

There have been programs written that will give a list of variables currently in the program. They work well, but you have to trace through the list to see if the variable you want to use is there. That's okay so long as the program isn't too long and you're not in any kind of hurry. But, when you get on a roll and your creativity and fingers are flying like a Concorde jet, those programs just won't do. So... *Vari-Scan* to the rescue. When you want to find out if a variable is in use, just type it, press RETURN, and bingo. You'll know in less time than it takes to yawn.

*Vari-Scan* automatically searches out any variable you choose, whether string, numeric, integer, or array. It's easy to use, and gets the job done pronto. It works equally well on both the C-64 and C-128.

After saving a copy of *Vari-Scan*, run it. The loader

POKEs the machine language data into memory and checks for errors. When it's done you can activate *Vari-Scan* by typing SYS 52000 for the C-64, or SYS 4864 for the C-128, and then pressing RETURN.

Whenever you want to see if your program contains a certain variable, just type the variable name and press RETURN. If your chosen victim is in the program, *Vari-Scan* returns the line numbers that have it. They can't run and they can't hide. You've got 'em now.

If the variable you're searching for is an array, you have a couple of options. You can scan for an exact match by entering the entire name such as A(1). A(1) would have to be in the program for a match to occur. But, if you want to know if the variable A is used in any arrays (e.g., A(J), A(1,5), A(2,X,7) ), enter the variable name like this:

A ( £

The LIRA (£) sign tells *Vari-Scan* to list all occurrences of A as used in arrays.

*Vari-Scan* can discern the difference between all variables. For example, let's say that you want to search for the variable A1. *Vari-Scan* will only scan for the numeric variable A1. It will not report any integer, string, or array variables of the same name, nor will it inadvertently report a variable containing an A, such as AB. The same holds true for other types of variables. *Vari-Scan* won't scan for anything in quotation marks, or on a line following a REM or DATA statement.

*Vari-Scan* checks for extended variable names. If you've used HOME\$ in a home budget program, *Vari-Scan* recognizes it as HO\$ (the same as the 64 and 128 does). So you don't have to worry about some weird variable sliding by your prying eyes.

*Vari-Scan* can be deactivated by pressing the BACK ARROW ( ← ) key. SYS 52000, or 4864, to reactivate it.

The next time you need an instant variable check, give *Vari-Scan* a try. It's easy to use, gets the job done fast, and keeps variable frustration at a minimum. Besides, who wants to do a tap dance on the keyboard? Then you couldn't use it as a frisbee. □

SEE PROGRAM LISTINGS ON PAGE 64

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Gauntlet	\$35	\$24
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NBA	\$40	\$28
Starfleet I	\$40	\$28
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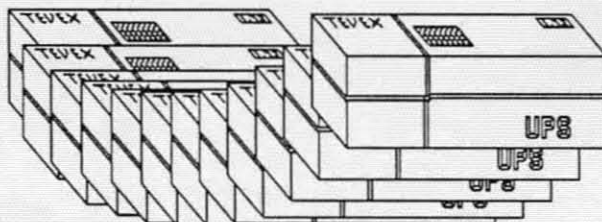
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# Thermal Connection

## Real-World Interface: Temperature Sensing

**T**he computer can do much more than merely execute programs. When connected to the proper devices, the computer can measure various characteristics of the real world (the world outside of the computer's circuitry), and it can control some of those characteristics. In previous articles we have connected the computer to photo-cells, light-emitting diodes, potentiometers, and relays. This month we will use a temperature-sensing device, a thermistor, to turn the computer into a moderately accurate digital thermometer.

Both the C-64 and the C-128 have built-in analog-to-digital converters. These are called "A to D" or simply "A/D" converters. The function of an A/D converter is to receive an analog input signal and to convert it to a digital value. Specifically, the A/D converters in the Commodore computers give an integer value from 0 to 255, which is proportional to the amount of resistance applied to their inputs.

### A TO D FUNDAMENTALS

If you apply a short circuit between the 5 volt supply voltage and the A/D's input, the A/D sees a resistance of zero ohms and converts this to a digital value of 0. If you leave the input to the A/D converter unconnected or open, the A/D sees essentially an infinite resistance between its input and the 5 volt supply. Then the A/D converter gives the largest value it can, namely 255.

The A/D converters in the Commodore computers give an output value of 1 for approximately every 10,000 ohms of input resistance. That is, 50,000 ohms corresponds to an A/D output of roughly 50. This is fairly accurate for resistance below 100,000 ohms and output values of less than 100.

Because of different A/D input circuitry, the C-64 reaches its maximum value of 255 with an input resistance of roughly 500,000 ohms, whereas the C-128 gives a maximum output of 255 with an input of about 250,000 ohms. Note that these are only "rules of thumb." Any serious application requiring

actual resistance values must calibrate the A/D converters. If you need only relative values ("is the paddle turned more to the left or more to the right?", for example), calibration may not be necessary.

Just to eliminate any confusion, I should mention that A/D converters generally convert analog input voltages (not resistance) into digital quantities. (Refer to *Analog to Digital Adventures*, October 1986 *Ahoy!*, for further discussion of A to D conversion.) Since voltage and resistance are related, it is appropriate and more useful to talk about input resistance in this application.

### CONVERSION SOFTWARE

The A/D converters are accessed through Control Ports 1 and 2 (the joystick ports) on the right side of the computer. Each port can handle two resistance inputs. Normally game paddles are plugged into the A/D pins of these ports. There are only two A/D converters in the Commodore computer, but there is an electronic switch which can select the inputs from either Port 1 or Port 2. That way two A/D converters take care of four analog inputs.

BASIC 7.0 in the C-128 uses the POT command to read the A/D converters. POT(1) and POT(2) give values corresponding to Control Port 1 inputs (closest to the front of the computer). POT(3) and POT(4) correspond to Control Port 2.

For the C-64, you must read the A/D converters by other means. On page 346 of the *C-64 Programmer's Reference Guide (PRG)* is a machine language program for reading all four A/D ("paddle") inputs. It states that reading the paddles from BASIC is not reliable. The machine language program *C-64 Paddle Routine* on page 66 of this magazine is a condensed version of the PRG program which allows inputs only in Control Port 1.

The procedure to perform an A/D conversion and to read the results is as follows:

1. Set the electronic switch at address \$DC02 (addresses

By Dale Rupert



are in hexadecimal) to enable Port 1 or Port 2 (or both) inputs to the A/D converters.

2. Wait briefly for the inputs to be converted.

3. Read the outputs of the two A/D converters at \$D419 and \$D41A.

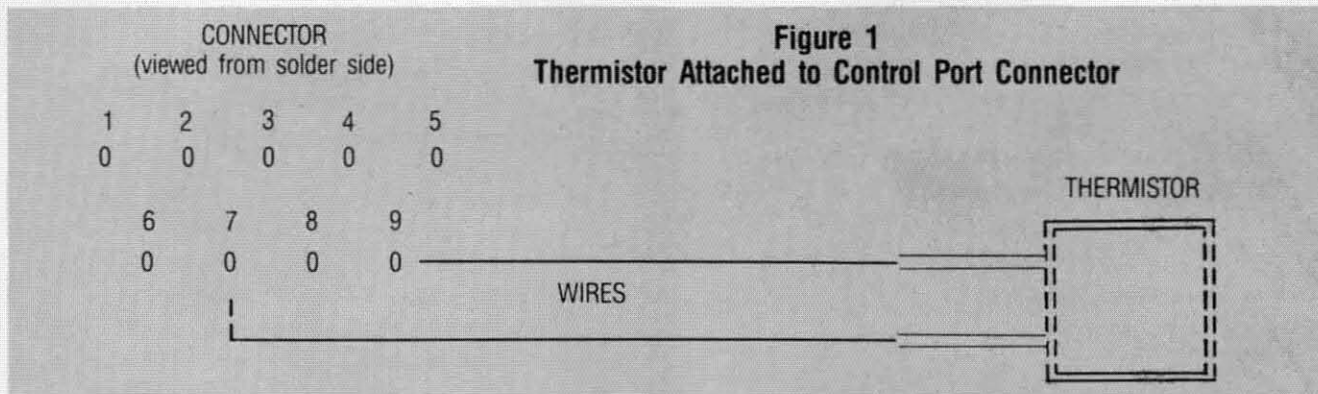
The remarks at the beginning of the machine language program provide more details. Note that interrupts must be disabled. The Complex Interface Adapter (CIA) chip has pins which can be inputs or outputs. Two of its pins (PA7 and PA6) are tied to the electronic switch. The Data Direction Register (DDR) of the CIA at address \$DC00 must be programmed so that those two pins are outputs. Then 1's are written to those two pins to close the switches and bring the Control Port paddle signals to the A/D converters.

This machine language program enables the inputs from both Port 1 and Port 2, although only Port 1 will be used. The A/D converters are part of the Sound Interface Device (SID) chip. They continuously convert whatever input is available. If nothing is plugged into either control port, the A/D converters see infinite resistance and give values of 255.

Although the PRG says BASIC is not reliable, I have found that these statements work nearly as well as the machine language routine:

```
PRINT PEEK(54297)
```

```
PRINT PEEK(54298)
```



They read the SID chip's A/D registers at \$D419 and \$D41A. The first address is for the A/D converter for input resistance between pin 7 (5 volts) and pin 9 (POT X) of the control port connector. The second address is the A/D converter which measures resistance between pin 7 (5 volts) and pin 5 (POT Y). Here "POT" stands for "potentiometer," which is a variable resistor.

### HARDWARE PREPARATION

You need less than \$5 worth of parts to convert your computer into a digital thermometer:

1. Subminiature D 9-pin female connector (Radio Shack 276-1538 or equivalent).

2. Thermistor (Radio Shack 271-110 or any other with at least 10,000 ohms at 25 degrees C).

3. Wire: any length, 20 to 24 gauge.

4. Epoxy or waterproof glue.

Solder two equal lengths of wire (I used about four feet

for each) to pin 9 and pin 7 of the 9-pin connector. Pin 9 is the POT X (paddle) input, and pin 7 is 5 volts. For convenience, you may twist the wires together.

Thermistors come in a variety of sizes and shapes. The one listed above is a small bead about the size of a pencil tip. Thermistors have two wire leads attached to them. The two leads of the thermistor are soldered to the other ends of the wire. It doesn't matter which wire goes to which lead of the thermistor. The schematic of the finished apparatus is in Figure 1.

Before using the thermistor with the program we will discuss, you must make its leads waterproof. Daub some epoxy, silicone glue, or other waterproof glue around the leads of the thermistor and the ends of the wire to which they are soldered. Don't coat the body of the thermistor itself any more than necessary to seal the leads. (Be sure the leads are not touching each other.)

### PLUG IT IN

After constructing the thermistor apparatus, plug it into Control Port 1 (the joystick port on the right side of the computer, the one closer to the front of the computer).

Remember that computer chips connected to pins on the Control Port connectors are static-sensitive. Chips in the computer can be damaged by electrostatic discharge. Discharge yourself by touching something metal before connecting or disconnecting anything (joysticks included) at these connectors. Don't use your computer in a very dry, static-prone environment without proper precautions.

Turn on the computer and enter this quick program:

#### C-64 VERSION:

```
10 PRINT PEEK(54297), : GOTO 10
```

or

#### C-128 VERSION:

```
10 PRINT POT(1), : GOTO 10
```

You should see a series of very close numbers, typically about 15 for the thermistor listed above at room temperature (70 degrees Fahrenheit). Those numbers are the digital outputs from the A/D converter as it measures the resistance of the thermistor.

If you get very erratic numbers, or all zeros, or all 255's, then something is wrong. All zeros means that either the

wires or thermistor leads are shorted together (touching). Look closely at both ends of the wires and check the connector for solder bridges.

All 255's means that either the wires are not well-soldered to the connector or to the thermistor, or the connector is not plugged into the computer connector firmly, or the thermistor is open-circuited (faulty), or the connector is plugged into the wrong control port.

If you see very random numbers, make sure you are plugged into Port 1. Turn your computer off, then back on, and reenter the program (make sure some other programs in the computer are not interfering with the thermistor—this would be a problem with only the C-64 version).

## THE THERMISTOR

If all went well, the number repeatedly displayed is a digital representation of the thermistor's resistance. Squeeze the thermistor in your hand. You should see the value on the screen change. It should decrease since the resistance of a thermistor decreases as the temperature rises. Notice that the value on the screen gradually changes to the new value. It takes a while for the thermistor to change temperature.

The advantages of the thermistor for our application are that it is a resistive device (unlike a thermocouple which is a voltage device), it is inexpensive (unlike a platinum Resistive Temperature Device or RTD), and it has a relatively large thermal sensitivity (its resistance changes by a factor of ten or more for a one hundred degree temperature change).

The disadvantage of a thermistor is that it is very non-linear. This means that its resistance does not change uni-

formly with temperature. In fact, the relation between resistance and temperature for a thermistor is given by this equation:

$$1/T2 = 1/T0 + 1/B * LN(R2/R0)$$

If the thermistor's resistance  $R0$  is known at a certain temperature  $T0$ , and if a calibration constant  $B$  is known for the thermistor, then any other temperature  $T2$  may be calculated from the above formula by measuring  $R2$ , the thermistor's resistance at that temperature. Note that  $LN$  is the natural logarithm function given by  $LOG$  in BASIC. Also note that temperatures must be given in degrees Kelvin. More on that later.

As we have seen, our computer has the ability to measure the thermistor's resistance. We will also let the computer perform the calculations in the formula to tell us the new temperature.

## CALIBRATION CAN BE FUN

We must measure the thermistor's resistance at two different *known* temperatures in order to calculate  $B$ , the calibration constant. The procedure we will use is this:

1. Measure resistance  $R1$  at room temperature  $T1$ .
2. Measure resistance  $R0$  at ice water temperature  $T0$ .
3. Calculate  $B$ , derived from the previous equation, since  $T1$  and  $T0$  are known:

$$B = LN(R1/R0) / (1/T1 - 1/T0)$$

You could use any two temperatures, but these are easy to obtain.

Once the computer determines the calibration constant

# U.S.S. PHOTO

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B, the thermistor can be used to measure any other unknown temperatures. The computer will determine any new temperature T2 with this procedure:

1. Measure resistance R2 at the new temperature.
2. Calculate the new temperature T2:

$$T2 = 1 / [ (1/T0) + (1/B) * \ln(R2/R0) ]$$

Notice that since this formula depends upon the ratio of the two resistances, it doesn't matter what units they are measured in as long as they are the same. We will use arbitrary Commodore A/D converter units for measuring resistance. Temperatures must be in degrees Kelvin.

### PUT IT ALL TOGETHER

If all the preceding has seemed too complicated, fear not. The program *Thermal Connection* on page 66 takes care of all the difficulties. Before you run this program you must

- 1) find out what your room temperature is (use a thermometer or look at your thermostat) and
- 2) put some cold water along with some ice cubes or crushed ice into a dish and set it where your thermistor plugged into the computer can reach it.

Plug the thermistor into Control Port 1 and run the program. Note that C-64 users must change lines 100, 1020, and 2030 as shown in lines 5001-5003. Also, C-64 users must add line 11 (shown in line 5000) and add lines 5010-49184. These changes for the C-64 replace the POT(1) function of the C-128.

The program asks if you already know the calibration constants for the thermistor. If you reply "N" to indicate that you don't know them, the program starts the calibration process beginning at line 3070. You must have the thermistor at room temperature (or any other known temperature except the freezing point of water). Enter that temperature in degrees Fahrenheit. (The computer will convert it to degrees Kelvin in line 3180.)

The program calls the routine at line 1010. You will see a display on the screen similar to the earlier test of the thermistor. Once the numbers appear to have settled to one or two values, press any key. The program calls the routine at line 2010 to read and average the next ten resistance readings. This value is R1, which corresponds to your room temperature T1.

Now you are instructed to put the thermistor into the ice water. The computer assumes its temperature T0 is 32 degrees F. Press any key to see the new A/D values on the screen. You should see them gradually increase until they reach some steady level. Again press any key once the numbers appear to have settled to one or two values. The computer averages the next ten readings and calls the result R0, corresponding to T0.

The computer has all the information to calculate the calibration constant B in line 3200. The values of B, T0, and R0 are then shown on the screen. You should write them down. That way, the next time you run the program you can enter them manually rather than going through the calibration process again. (My values with the listed thermistor are typically B=2884, T0=273, and R0=29. Room temperature T1 of 293 degrees K (68 degrees F) gives an A/D reading R1 of 15.)

Press any key once you have recorded the calibration con-

stants. You are returned to the main loop at line 100 which repeatedly reads the thermistor's resistance R and converts it to a temperature T in degrees Kelvin in line 110.

There are four user-defined functions beginning at line 20. FNR takes any number and properly rounds it off to one decimal place. FNK2F ("K to F") takes a temperature in degrees Kelvin and converts it to degrees Fahrenheit. FNF2K converts degrees Fahrenheit to degrees Kelvin. FNT is the basic thermistor formula which converts resistance into temperature in degrees Kelvin.

Line 120 converts the calculated temperature to degrees Fahrenheit, rounds it off, and displays it. Line 130 converts degrees Kelvin to degrees Celsius (TC = TK - 273), rounds it off, and displays it as well. The Kelvin temperature scale is sometimes called the "absolute" temperature scale since 0 degrees Kelvin is absolute zero—the lowest possible temperature.

### ON YOUR OWN

Even though the temperature is displayed to the nearest tenth of a degree, the thermistor and the A/D converter in the computer do not really provide that resolution or accuracy. You will notice that at higher temperatures such as 130 degrees F (holding the thermistor near a light bulb), the readings jump by as much as 20 degrees at a time. This is because a difference of one in the A/D reading corresponds to 20 degrees in this temperature range. The resolution is even worse at higher temperatures, but it is still adequate for many applications.

You can write a program to monitor the temperature every fifteen minutes and to graph the results. You might have the computer generate an alarm sound whenever the temperature exceeds a specified range. Data logging and remote sensing are just two of the advantages of using your computer as a thermometer.

A second thermistor can be easily added to Control Port 1. Add another wire to pin 7 (5 volts) and a wire to pin 5 (POT Y). In *Thermal Connection* read the second thermistor with PEEK(252) instead of PEEK(252) for the Commodore 64, or use POT(2) for the Commodore 128. It is possible to connect and read as many as four thermistors at once, but C-64 owners should use the four-paddle program given in the *Programmer's Reference Guide* if more than two are used.

You can measure relative humidity with two thermistors. Wrap one in a cotton wick and keep it wet. Spin it rapidly overhead in a medium-sized circle and record the temperature. Leave the other one dry and record its temperature. The temperature difference between the two is because of the evaporation rate from the wet one, and that depends upon the relative humidity. A book on meteorology or psychrometry will show you how to convert the temperature difference into relative humidity.

Let me know what other applications you come up with. Hmm. I wonder how cold the rock salt and ice makes my ice cream freezer. I wonder if my old 1541 disk drive is really hot enough to melt steel. I wonder how well my attic insulation works. I wonder how much the temperature in my refrigerator varies throughout the day. How did I ever manage without a computer-based thermometer? □

SEE PROGRAM LISTINGS ON PAGE 66

# WINDOW DRESSING

## For the C-128

By Richard Curcio

**A** well-placed window can give a C-128 BASIC program a very sophisticated look. The WINDOW statement in BASIC 7.0, however, is essentially a no-frills command. *Window Dressing* provides four routines to enhance your text screen displays. Program 1 POKes the machine language for *Window Dressing* into location 4864. It can be located elsewhere by changing the variable SA in line 110. The program uses 247 bytes plus 200 bytes for storage immediately after the ML. The four routines are accessed with SYS statements. If SA is the start address, then FRAME=SA, AT=SA+3, CR=SA+6, and ED=SA+9.

### WINDOW FRAME

Calling FRAME quickly prints a neat box around the perimeter of the current window and (optionally) a heading at the top of the box. A window is then opened inside the box. Your WINDOW statement should therefore open a window two columns wider and two rows taller than needed. The syntax is SYS FRAME [,,, heading]. The five commas *must* be present if a heading is called for. The routine uses the current character color and mode (normal or reverse) for the frame. The characters used are COMMODEORE A, SHIFT \*, and COMMODEORE S for the top, SHIFT -, cursor right, and SHIFT - for the sides, and COMMODEORE Z, SHIFT \* and COMMODEORE X for the bottom. These characters were chosen because they appear the same in uppercase/graphics or upper/lower case. They can be changed.

The heading can be anything PRINTable: string or numeric variables or literals, color changes, cursor controls, etc. The heading begins at the upper left corner of the frame. Start the heading with a cursor right if you don't want to overwrite the corner character. There is no error checking of the length of the heading versus the width of the win-

dow. If the heading is a string variable, the LEN and RWINDOW(1) functions can be used to determine if the heading is too long for the window's width. Note that RWINDOW(0) and (1) return the number of rows or columns minus one.

Once the inner window is opened, the routine performs a "dummy" PRINT. This turns off reverse printing if it was enabled.

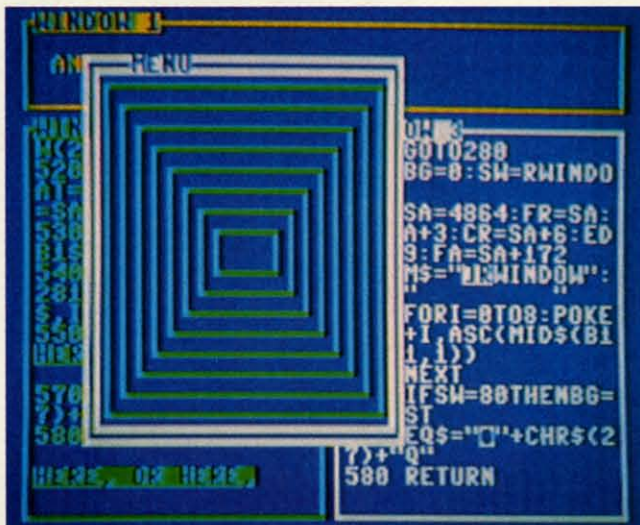
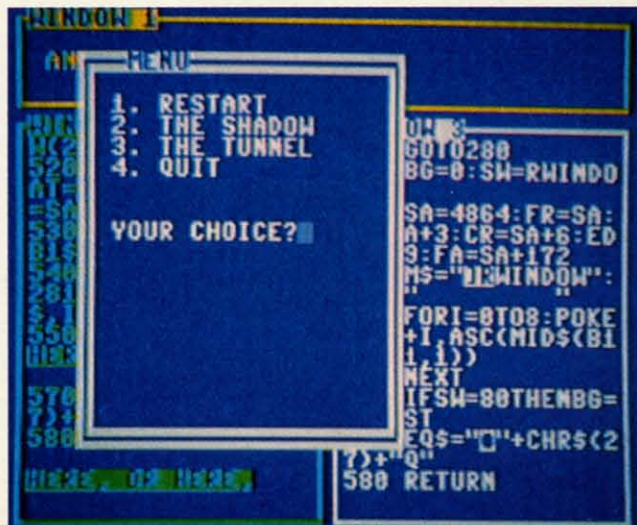
### PRINT AT AND CURSOR RESTORE

While CHAR can be used as a form of PRINTAT on a text screen, there are a few problems with this. The CHAR statement will only print characters within quotes or string variables. Numeric values must first be converted to strings using STR\$. Strings must be concatenated if you want to include more than one in a CHAR statement. CHAR0,5,10,M\$;H\$ causes a SYNTAX error. Once CHAR has moved the cursor, it cannot easily be returned to where it came from. Early versions of the C-128 ROMs have a bug when CHAR is used in 80 columns.

The Kernal PLOT routine at 65520 (or 49176) could be used to move the cursor to a selected row and column before a PRINT statement. The "AT" routine provides a few enhancements to this approach:

SYS AT, flag, row, column [,string]

The first value, flag, determines whether the cursor will be returned to where it was before SYS AT. This parameter cannot be omitted. If 0, the cursor is restored. Any value from 1 to 255 defers cursor restoration. The cursor position is saved, but will not be restored until SYS CR. This allows us to follow SYS AT with multiple PRINT statements before returning the cursor to its original position, if at all. Row and column refer to the current window dimensions. Note that these are in a different order than that used by



PHOTOS: MICHAEL R. DAVILA

CHAR. If row or column are beyond the dimensions of the current window, AT returns with ILLEGAL QUANTITY. Error messages for this routine and the next can be turned off by POKEing any non-zero value into SA + 21. Your program could use RWINDOW(0) or (1) to determine the window dimensions and make corrections if an upcoming row or column will be out of range.

The double commas preceding "string" must be present. String is anything PRINTable, including ESC codes. Although there are routines in ROM to save and restore the cursor position, these are used by a number of ESC characters. If AT were to use these routines, certain ESC codes in the AT string would destroy the previous cursor position. The AT routine stores the cursor column and row in more secure locations (SA+22 and 23). SYS CR restores the cursor to where it was before the most recent SYS AT.

## ED

A number of locations in zero-page and page three keep track of the screen dimensions, character color, cursor location, where the tab positions are, and which screen lines are linked or continued from the previous line. These values are called the Screen Editor variables. The final routine saves and recalls five sets of editor values:

SYS ED, set, dir

where "set" is 0 - 3 and "dir" is 0 to save, and any non-zero value to recall. This will allow a program to jump from window to window, printing menus, receiving INPUT, or resuming PRINT where it left off. For four sets of editor values, the routine uses 200 bytes immediately following the ML. Storage can be moved elsewhere. Note that the contents of the screen are not saved—only those parameters mentioned above.

## THE DEMO AND ALTERATIONS

Program 2 demonstrates usage of the *Window Dressing* routines. It assumes that the ML is located at address 4864. Change the value of SA in line 520 if *Window Dressing* is located elsewhere. The program determines which screen is in effect using RWINDOW(2) in line 510, and adjusts itself to 40 or 80 columns. In line 530, alternative frame characters are defined. The codes for these characters are POKEd into the cassette buffer. When needed, the FRAME routine is altered to use these characters by POKEing SA + 172 and 173 with the low byte and high byte of the first address of the new characters. (POINTER cannot be used for this because the characters must be in RAM 0 with the

## Source Code for Window Dressing

Compiled in 64 mode using the PAL assembler (Pro-Line, Inc.)

```
10 SYS700
20 .OPT P,00
30 * = $1300
40 ;
50 ;----- WINDOW DRESSING
60 ;
70 CHRGOT = $0386
80 ;
90 ;ENTRY POINTS
100 ;
110 CLV:BVC BEGIN;DRAW WINDOW FRAME
120 ;
130 CLV:BVC PRTAT;PRINT AT
140 ;
150 CLV:BVC RSTCRS;RESTORE CURSOR
160 ;
170 CLV:BVC LINKS;SAVE/RECALL ED VALS
180 ;
190 FRAME .ASC "[c A][s *][c S][s -][RI
GHT][s -][c Z][s *][c X]";FRAME CHRS
200 ERREN .BYT 0;ERR MSG ENABLED
210 TEMP .BYT 0,0;HOLDS CRSR ROW/COL
220 ADDBL .BYT 0,40,80,120,160;USED TO
CALCULATE STORAGE LOCATION
230 ;
240 BEGIN JSR $C150;CRSR HOME
250 LDA $F8
260 STA $CF;SAVE SCROLL FLAG
270 JSR $CAE5;DISABLE SCROLL
280 LDX #$FF
290 JSR FRPRT
300 LDY $E5;GET TOP ROW
310 INY
320 STY $CE
330 LFTEDG JSR FRPRT;START AT LEFT EDGE
340 INC $CE
350 LDY $CE
360 CPY $E4;HAVE WE REACHED BOTTOM?"
370 BEQ BOTTOM
380 DEX
390 DEX
400 DEX
410 BNE LFTEDG
420 BOTTOM JSR FRPRT
430 JSR $C854;CRSR RT MOVES TO HOME
440 JSR CHKSTR;PRINT ANY HEADING
450 LDA $CF
460 STA $F8;RESTORE SCROLL FLAG
470 ;
480 SMALL INC $E5
490 INC $E6;OPEN A WINDOW
```

```
500 DEC $E4
510 DEC $E7;INSIDE THE FRAME
520 JSR $CA32;CLR SCREEN LINKS
530 JMP $C76F;PRINT RETURN & RTS
540 ;
550 PRTAT PHA;RESTORE CURSOR IF A=0
560 LDA $EC
570 STA TEMP;SAVE CRSR POS
580 LDA $EB
590 STA TEMP+1
600 MOVEIT CLC;WILL MOVE CRSR
610 JSR $C018;CALL PLOT. X=ROW, Y=COL
620 BCS ERR1;IF X & Y INVALID
630 JSR CHKSTR
640 PLA;GET ACCUML
650 BEQ RSTCRS
660 DONEPLOT RTS
670 ERR1 PLA
680 ERRMSG LDA ERREN;IF ZERO PRINT MESS
AGE
690 BNE DONEPLOT
700 JMP $7D28;ILLQTY
710 ;
720 LINKS CMP #$05
730 BCC LINK2
740 BCS ERRMSG
750 ;
760 RSTCRS LDA TEMP
770 STA $EC
780 LDA TEMP+1
790 STA $EB
800 JMP $C15C;SET POINTERS
810 ;
820 CHKSTR JSR CHRGOT;PRINT ANYTHING?"
830 BEQ DONEPLOT;NO
840 JSR $795C;CHK COMMA
850 JMP $555A;PRT STRING
860 ;
870 FRPRT JSR PRTIT;LEFT EDGE
880 LDY $E6;LEFT COL.
890 INY
900 INX
910 CENT JSR PRTIT+1;CENTER
920 INY
930 CPY $E7;RIGHT COL
940 BNE CENT
950 ;
```

```
960 PRTIT INX
970 LDA FRAME,X
980 JMP $C00C;PRINT CHR IN A & RTS
990 ;
1000 LINK2 STX $C3
1010 TAY
1020 LDA #<AREA
1030 LDX #>AREA
1040 CLC
1050 ADC ADDBL,Y
1060 BCC LINK3
1070 INX
1080 LINK3 LDY $C3
1090 STA $C3
1100 STX $C4
1110 LDX #$1A
1120 TYA
1130 BNE LINK6
1140 LDY #$25
1150 LINK4 DEY
1160 LDA $E0,X
1170 STA ($C3),Y
1180 DEX
1190 BPL LINK4
1200 LDX #$0D
1210 LINK5 DEY
1220 LDA $0354,X
1230 STA ($C3),Y
1240 DEX
1250 BPL LINK5
1260 RTS
1270 ;
1280 LINK6 LDY #$25
1290 LINK7 DEY
1300 LDA ($C3),Y
1310 STA $E0,X
1320 DEX
1330 BPL LINK7
1340 LDX #$0D
1350 LINK8 DEY
1360 LDA ($C3),Y
1370 STA $0354,X
1380 DEX
1390 BPL LINK8
1400 RTS
1410 ;
1420 AREA .BYT 0;EDITOR STORAGE BEGINS
```

## PRESERVING 80 COLUMN SCREENS

The memory-moving feature of *TextSave* (January 1988) can be combined with *SYS ED* to save and recall two 80 column screens. In this way, you could save the screen, open a window, and then recall the screen, replacing what was overwritten by the window.

First, some memory must be set aside in RAM 0 to hold the 4K of each 80 column screen:

### GRAPHIC 1: GRAPHIC 0

sets aside 9K of memory beginning to address 7168 normally used for a bit map display. This area will be safe until a *GRAPHIC CLR* command. The *BASIC* subroutine to save/recall 80 columns should look something like this:

```
2000 POKE 195,0: POKE 196,SH: POKE 174
,0: POKE 175,EH
2010 SYS TS+236,0,0,D1: SYS ED,S,D2: R
ETURN
```

Line 2000 sets up the start and end address (+1) in RAM 0 for *TextSave* to move. "SH" is the start address divided by 256 and "EH" is 4096 bytes higher, also divided by 256. In line 2010, "TS" is the start address of *TextSave* and 0, 0, tells the routine to start at address 0 in VDC memory, the normal location of 80 column text. Direction D1 is 0 to move data to 80 column memory and D2 is > 0 to restore screen editor values. To save an 80 column screen, D1 is > 0 and D2 = 0. "S" is the set of editor values. It's up to you to keep track of which set goes with which display.

ML.) The default characters can also be changed by *POKE*-ing new codes into SA + 12 through SA + 20 in the order described earlier.

In line 340, *SYS 52591* calls a ROM routine to turn on the cursor. This provides a cursor for use with *GET* or *GETKEY* as an alternative to *INPUT*. The cursor is turned off by calling another ROM routine at location 52639 with 32 in the accumulator.

To change the location of editor storage, *POKE* the low byte and high byte of the storage address into SA + 181 and SA + 183. Each set requires 40 bytes. If error messages are disabled as described earlier, storage can be in RAM 0 above 16383. The computer must be in the BANK 0 configuration in this case, before *SYS ED*. For the other routines, the C-128 must be in BANK 15 since several ROM routines are used. "AT" and "ED" set the processor carry flag if any values are out of range, so *RREG,,SR*, immediately after the *SYS*, reads the status register into SR. IF SR AND 1 = 1 THEN something went wrong.

If error messages are enabled, the *TRAP* statement of *BASIC 7.0* can be used to prevent *ILLEGAL QUANTITY* from messing up your screen. Note that parameters greater than 255, or strings where numbers should be, cause *SYS* to return with the appropriate error message regardless of the condition of the *Window Dressing* error message flag. □ **SEE PROGRAM LISTING ON PAGE 69**

# FLOTSAM

Send your comments on any aspect of Commodore computing to *Flotsam*, c/o *Ahoy!*, Ion International Inc., 45 West 34th Street—Suite 500, New York, NY 10001.

I would like to thank you for the past few years of very good reading. The magazine is well-balanced, with a wide variety of articles. It seems to cover all the different aspects of Commodore computing, not to mention the talented writers. Of course, I do have a complaint or two. I don't feel that the average Commodore user is that interested in *COMAL*. This section could possibly be used to teach beginners *BASIC*, *ML*, everyday commands, etc.

I am an average user who is eager to learn in a non-complicated way (like most people I talk to). Between work and life's other necessities, I don't have the time to study as much as I should, so I like your magazine and its quick tips. Again, thank you for making computing on my C-128 less frustrating and more enjoyable.

—John Burke  
Rosedale, NY

*We began our COMAL Column because we felt the language had not received the press it deserved. But space, as you indicate, is at a premium. As of the next installment (September), COMAL coverage will cease for the time being.*

There is very little software available for the C-128 in its 128 mode, and there appears to be little on the horizon. Therefore, when *Ahoy!* publishes a program for the 128 that uses some of the great characteristics of the machine, 128 owners are naturally very enthusiastic.

I recently read that Commodore had sold one million C-128's. That is a large number for potential sales of software and is generally being ignored by the software houses. However, there is a possible alternative. If *Ahoy!* were to publish a special issue on a yearly basis dedicated only to the C-128, I believe that C-128 owners would feel that they had died and gone to heaven and would make such a venture a huge success. With Blakemore, Rupert, et al, you certainly have the talent to put it over.

—Neal Smith  
Rochester, NY

*We'd love to do as you suggest, Neal. But remember the Aesop's fable about the man with the donkey? See below.*

I first became interested in your mag because of *Tips Ahoy!* As a relatively new Commodore owner, I was hungry for programming hints and tricks. I was satisfied for awhile, but it seems lately you've been allotting an unproportionate amount of space to the 128 user. Please don't assume that just because breakthroughs in computer technology have been advancing at phenomenal rates that all of us 64 owners have been experiencing the same phenomenon with regards to our salaries. Heck, there are a lot of us that haven't even utilized the potential of our 64's yet. I don't think your readers would mind a couple fewer game programs if it meant expanding your more useful columns (i.e., *Tips Ahoy!* and *Flotsam*).

—Tom Rowan  
Ft. Wayne, IN

Send your best programming and hardware hints for the C-64, C-128, or Amiga to *Tips Ahoy!*, c/o Ion International Inc., 45 W. 34th St.—Suite 500, New York, NY 10001. Include a stamped and self-addressed envelope.

## LET YOUR FUNCTION KEYS ESCAPE

The Commodore 128 has numerous useful and entertaining ESC-key combinations, some of which are so darn good you wonder why Commodore didn't put a specific key for them right on the keyboard. ESC-D, for instance: that one deletes one line on the screen, moving all the text after it up one line. I use it all the time! But I'm lazy, and absolutely hate having to press two keys to do anything. So in the interest of cutting my typing in half:

```
KEY7,CHR$(27)+"D"
```

Now when F7 gets pressed, it does the same thing as an ESC-D. Follow that up with:

```
KEY8,CHR$(27)+"I"
```

and pressing F8 inserts a line. I know, I know, we're back up to two keypresses, SHIFT plus F7, but now they're in the same corner of the keyboard. (And easier to find at 3:00 a.m.!) After all, they're related functions, right? Now try these:

```
KEY1,CHR$(27)+"A"+CHR$(27)+"E" :REM AUTO
INSERT ON, CURSOR FLASH OFF
KEY2,CHR$(27)+"C"+CHR$(27)+"F" :REM AUTO
INSERT OFF, CURSOR FLASH ON
KEY3,CHR$(27)+"V" :REM SCROLL TEXT UP ON
E LINE
KEY4,CHR$(27)+"W" :REM SCROLL TEXT DOWN
ONE LINE
```

Nothing fancy, just some more "related" ESC codes and suggested function keys to store them in. If you really like a particular sequence, you can preserve it forever by typing a line number before the KEY command:

```
1000 COLOR0,1:COLOR4,12
1010 KEY5,CHR$(27)+"T" :REM SET UPPER LE
FT CORNER OF WINDOW
1020 KEY6,CHR$(27)+"B" :REM SET LOWER RI
GHT CORNER OF WINDOW
```

I have a more elaborate version of that little program saved on my main C-128 programming disk, named "KEYS". The first thing I do when I turn on my 128 is type RUN"KEYS" and all my favorite function key combos are restored, along with a pleasing screen color. You can build tremendously elaborate ESC-key combos into the function keys.

—David F. Paulsen  
Houston, TX

## Compiled by Michael R. Davila

### RIPPLES

This short program for the C-64 and C-128 plots several concentric circles in extended background mode, then cycles through the different registers to give the illusion of motion. It takes about five minutes to plot all the circles, so be patient. This is one of those deals where the display looks good, but it's left up to you to find a good application.

—Cleveland M. Blakemore

```
•10 REM RIPPLES FOR THE C-64 OR C-128
•20 V=53248:N=6.3:H=20:W=12:M=19:U=1:L=.5
:K=40:B=1024:J=24:G=64:S=32:OF=54272
•30 PRINT"[CLEAR]":POKE53281,,:POKE53280,
:POKE53265,PEEK(53265)OR64
•40 POKEV+34,1:POKEV+35,12:POKEV+36,11
•50 E=30/25:C=1:FORR=MTOSTEP-U
•60 FOR T=.TONSTEP(U/(R+R)):X=INT(E*R*COS(
T)+H+L):Y=INT(R*SIN(T)+W+L)
•70 P=Y*K+X+B:IFX>.ANDX<KANDY>.ANDY<JTHEN
POKEP,S+G*C
•80 NEXT T:C=C+U+(C=3)*3:NEXT
•90 POKEV+34,0:POKEV+35,0:POKEV+36,6
•100 A=PEEK(V+34):B=PEEK(V+35):C=PEEK(V+3
6):POKEV+34,B:POKEV+35,C:POKEV+36,A
•110 FORX=.TO60:NEXT:GOTO100
```

### SPLIT FACE

*Split Face* scrolls half the screen left and the other half right. All character colors are maintained as your screen takes on a split personality. Now you have a clear screen that's ready for your next title, menu, or graphics display.

Append *Split Face* to your own programs and have them run the loader to POKE the data into memory. It works on the C-64 and C-128 in 40 column mode. Whenever you want *Split Face* to drop the hatchet, enter the following:

```
100 SYS 49152
```

For the C-128 it would be:

```
100 SYS 4864
```

The line numbers are only examples. You can use any line number you want.

To demonstrate, run the loader. Now list the program to fill the screen. Cursor to the top and enter in direct mode (no line number):

```
SYS 49152
```

(SYS 4864 for the C-128), then press RETURN. Your characters will split like a knife through butter.

*Split Face* can be relocated by changing the variable A

# BACK ISSUES OF *Ahoy!*

<p><b>#2—FEB. '84</b> Illustrated tour of the 1541! Artificial intelligence! Synapse's Ihor Wolosenko interviewed! String functions! And ready to enter: Music Maker Part III! Screen Manipulation! Night Attack! Relative Files!</p>	<p><b>#3—MAR. '84</b> Anatomy of the 64! Printer interfacing for VIC &amp; 64! Educational software series begins! VIC game buyer's guide! And ready to enter: Address Book! Space Lanes! Random Files on the 64! Dynamic Power!</p>	<p><b>#5—MAY '84</b> Future of Commodore! Inside BASIC storage! Memory management on the VIC &amp; 64! Guide to spreadsheets! Hurray for arrays! And ready to enter: Math Master! Air Assault! Biorhythms! VIC Calculator!</p>	<p><b>#7—JULY '84</b> MSD dual disk drive! Database buyer's guide! Training your cursor! Screen displays! File Sleuth! Users Groups! And ready to enter: Renumbering! Checklist! Math Defender! Brisk! What's My Job?</p>
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<p><b>#12—DEC. '84</b> Buyer's guide to printers! 1525 printer tutorial! Fast graphics with custom character sets! Guide to KMMM Pascal! Diving into BASIC! And ready to enter: Construction Co.! Space Patrol! Cross Ref!</p>	<p><b>#13—JAN. '85</b> VIC and 64 OS exposed! Sprites! Insert a 1541 device &amp; disconnect switch! Ghostbusters! And ready to enter: Ultra Mail! Music Tutor! Alice in Adventureland! Midprint! To the Top! Tape/Disk Transfer!</p>	<p><b>#14—FEB. '85</b> Printer interfacing! Multicolor sprites! Modems! Bulletin Boards! Theory of game design! Buying a modem! And ready to enter: Futurewar! Fontasia! VIC Eraser! Insurance Agent! Flankspeed! Telexlink 64!</p>	<p><b>#15—MAR. '85</b> Creating multiscreen gameboards! Inside the Plus/4! Commodore DOS! And ready to enter: Old Routine! Programmable Functions! Automatic Line Nos.! Home Budget! Salmon Run! Numerology!</p>
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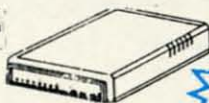
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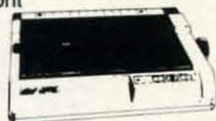
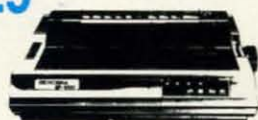
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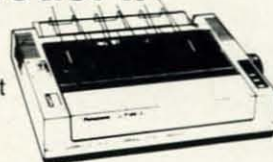
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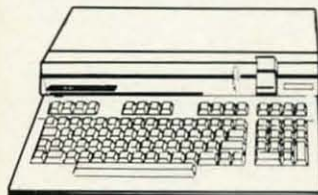
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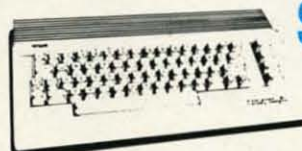
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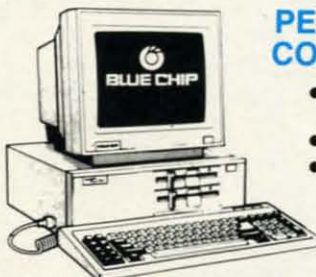
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in line 1. Be sure to SYS to the new address if you do change it.

—Buck Childress  
Salem, OR

```

1 A=49152:REM * (A=4864 FOR THE C-128) *
  (BOTH VERSIONS CAN BE RELOCATED.) *
2 FORJ=ATO+107:READB:POKEJ,B:X=X+B:NEXT
  J
3 IFX<>17061THENPRINT"ERROR IN DATA[3".
  ]":END
4 REM *** YOU COULD PLACE A RETURN HERE
  IF THIS IS USED AS A SUBROUTINE. ***
5 DATA169,20,133,250,169,0,162,4,160,216,
  133,251
6 DATA133,253,134,252,132,254,162,24,160,
  38,177,251
7 DATA200,145,251,136,177,253,200,145,25
  3,136,136,192
8 DATA20,176,239,160,20,169,32,145,251,1
  60,1,177
9 DATA251,136,145,251,200,177,253,136,14
  5,253,200,200
10 DATA192,21,144,239,160,19,169,32,145,
  251,165,251
11 DATA24,105,40,133,251,144,2,230,252,1
  65,253,24
12 DATA105,40,133,253,144,2,230,254,202,
  16,181,160
13 DATA10,202,208,253,136,208,250,198,25
  0,208,153,96

```

## SURVEYOR

1000 screen and 1000 color RAM locations! Now just how are we as mere mortals supposed to look at the monitor and know exactly where each one is? If you're trying to POKE characters and colors to various locations, it can quickly become hair-pulling time.

You can always use the chance method. Throw darts at the monitor from 10 paces and figure that's close enough. Trouble is, they don't stick too well. And, if they do, you'll wind up with an air-conditioned screen.

Take heart. There is a better way. And it's 100% accurate. *Surveyor* instantly gives you the screen and color RAM locations of any place you choose. Let's give it a whirl.

First load and run *Surveyor*. To activate it, type SYS 49152 and press RETURN. Now you can survey the situation.

Just cursor to a desired target and press the SHIFT and CONTROL keys at the same time. Two numbers will appear. The first is the screen RAM location and the second is the color RAM location. Try it again. Nice and easy, nice and quick.

*Surveyor* can easily be relocated if you want. Just change the variable A in line 2 to your new starting address. Don't forget to SYS there if you do.

RUN STOP/RESTORE deactivates *Surveyor*. SYS to the appropriate address to reactivate it.

Don't pull your hair out. But, if you do, maybe you can sell it for a toupee.

—Buck Childress  
Salem, OR

```

1 REM *** SURVEYOR C-64 ***
2 A=49152:PRINTCHR$(147)
3 FORJ=ATO+95:READB:POKEJ,B:X=X+B:NEXTJ
4 IFX<>14696THENPRINT"ERROR IN DATA[3".
  ]":END
5 C=INT(A/256):D=(A-(C*256))+13:POKEA+1,
  D:POKEA+3,C
6 PRINT"DATA OK * SYS"A"TO ACTIVATE[3".
  ]":END
7 DATA169,13,162,192,120,141,143,2,142,1
  44,2,88
8 DATA96,173,141,2,166,254,133,254,201,5
  ,208,69
9 DATA228,254,240,65,169,1,133,204,165,2
  11,133,252
10 DATA165,214,133,253,165,209,166,210,2
  4,101,252,144
11 DATA1,232,134,251,170,165,251,32,205,
  189,169,42
12 DATA32,210,255,165,243,166,244,24,101
  ,252,144,1
13 DATA232,134,251,170,165,251,32,205,18
  9,166,253,164
14 DATA252,24,32,240,255,169,0,133,207,7
  6,72,235

```

## FASTER CHARACTERS IN BASIC 7.0

The following program redefines the character set in only two seconds. A FOR/NEXT loop would take 32 seconds.

Lines 50 and 60 move the character ROM into the bit map screen. The monitor is called via a function key.

Lines 80 through 110 give you underlined letters. To access them, press the letter keys with the logo key. The effect is much better if you use capitals in line 80.

The next 12 lines are for simple animation. Circles are drawn on one character then copied to the space character.

—James Glaser  
Burney, CA

```

10 COLOR 0,1:COLOR 1,4:COLOR 4,1
20 GRAPHIC 1,1:GRAPHIC 0,1:BANK 15
30 PRINT "[HOME][HOME][3"[DOWN]]"TAB(15
  )"WORKING[3"."]"
40 WINDOW 0,13,39,24,1
50 KEY 1,"[CLEAR][BLACK]MONITOR"+CHR$(13
  )+"T ED800 ED[3"F"] E3800"+CHR$(13)+"X"+
  CHR$(13)+"GOTO70"+CHR$(13)
60 POKE 209,PEEK(4096):POKE 210,0:END
70 KEY 1,"GRAPHIC":GRAPHIC 2,0,13:COLOR
  5,14
80 TEXT$="<->.* [s K][s I][s T]=[s G]+[s
  M]!" +CHR$(34)+"[s N][s Q][s D][s Z][s S
  ][s P][s A][s E][s R][s W][s H][s J][s L
  ][s Y][s U][s O]?[s F][s C][s X][s V][s
  B]"
90 POKE 4588,216:CHAR,19,21,TEXT$
100 FOR A=91 TO 127:R=14343+A*8

```

Continued on page 82

# THEY-DO-RUN-RUN-RUN- THEY-DO-RUN-RUN

By Richard Herring

**S**peed. Raw, blinding, power-user speed. Amigas running anywhere from 7.14 megahertz to over 14 MHz with turbo boards sharpening the cutting edge.

How can the poor C-64 keep up at a piddley 1 MHz? Or even the C-128 in fast mode at a dawdling 2 MHz? But obviously they do keep up, as is evidenced by some of the fine and very powerful software available.

For a given computer, speed can be significantly enhanced by two things: programmer's tricks and programmer's tools. Tricks come with experience. Tools are equally available to all of us—often off the shelf.

One key tool is the language in which we each choose to program. Several of you have asked just how fast COMAL is. Forget for the moment how its structure enhances programming and debugging. If COMAL is not at least as fast as other languages, then it's not what some of you power programmers are looking for.

Enter Herbert Denaci, engineer and speed aficionado. While I was doing some of the background work on this column, he and I exchanged a few letters. Denaci has done exactly the kind of speed testing that will be useful in proving COMAL's value. So we'll explore his benchmarks, as well as a few others, and you can judge COMAL for yourself.

## Denaci's Benchmarks—C-64 or C-128 at 1 MHz

(Scores are ranked against BASIC 2.0. A score of .50 means the benchmark ran in half the time BASIC took.)

	Sieve	Trig	Flight	Ahl's
COMAL 0.14	.74	1.00	.69	.97
COMAL 2.0	.30	.98	.54	.22
BASIC 2.0	1.00	1.00	1.00	1.00
BASIC 7.0	1.46	1.08	1.28	1.09
Pascal				
(Oxford)*	.14	1.05	.67	.55
PROMAL*	.06	1.13	.86	1.45

\*The "run" times for Pascal and PROMAL do not include the separate step of compiling the source code. Compile times vary from 7 to 94 seconds on these benchmarks, which run in anywhere from 1/2 to 5 minutes.

Now no benchmark gives an absolutely true picture

of a language's speed. What you want as a programmer is the most speed for the particular program you're writing right now. The useful speed of the language will change as the demands of your program vary. All a benchmark can do is provide a comparison based on the features it happens to exploit.

Let's look first at the Sieve of Eratosthenes. It has been used as a programming algorithm since at least 1969. All it does is find prime numbers. Sieve is generally used to test a high-level language's performance in Boolean algebra. It also gives an indication of the language's abilities in array handling, memory references, and structured control statements.

The heart of Denaci's translation of Sieve, into COMAL 0.14, is:

```

0130 FOR I#:=0 TO SI# DO
0140 IF FLAGS#(I#) THEN
0150 PRIME#:=I#+I#+3
0160 K#:=I#+PRIME#
0170 WHILE K#<=SI# DO
0180 FLAGS#(K#):=FALSE
0190 K#:=K#+PRIME#
0200 ENDWHILE
0210 COUNT#:=+1
0220 ENDIF
0230 ENDFOR I#

```

Sieve has a lot of calculations to perform. Writing it this way allows it to be a real screamer because: 1) it doesn't use division, 2) it uses prior knowledge about numbers that cannot be primes (even numbers), 3) it already knows that 0, 1, 2, and 3 are the first four primes, and 4) it calculates primes as the value of the variable PRIME#, or twice the current array index plus three.

To stretch out the test a little, a major loop is run 10 times with these additional lines:

```

0080 DIM FLAGS#(0:SI#)
0090 FOR ITER#:=1 TO ML# DO
0100 FOR I#:=0 TO SI# DO FLAGS#(I#):=TRUE
0110 PRINT "LOOP ",ITER#
0120 COUNT#:=0

```

```
0240 ENDFOR ITER#
0250 PRINT "COUNT=";COUNT#
```

### Denaci's Benchmarks—C-128 at 2 MHz

(Scored against BASIC 2.0)

	Sieve	Trig	Flight	Ahl's
COMAL 0.14	.73	1.03	.78	.97
COMAL 2.0	.30	1.00	.60	.22
BASIC 2.0	1.00	1.00	1.00	1.00
BASIC 7.0	1.38	1.21	1.35	1.04
FORTRAN (Nevada)*	—	5.70	2.84	1.60

\*The run times for FORTRAN use the C-128's Z80 microprocessor and do not include the separate compile times.

Denaci's calls his second benchmark Trig. It uses trigonometry functions that are typical of those used in flight dynamics problems. The heart of this benchmark, in COMAL 0.14, is:

```
0100 ITERATION:=0
0110 A:=.1
0120 B:=.2
0130 FOR ITERATION:=1 TO 1000 DO
0140 C:=SIN(A/B)*COS(A/B)
0150 ENDFOR ITERATION
```

The Trig benchmark is just a warmup for Denaci's real interest—the Flight Dynamics Simulation benchmark. He

wrote this 145-line benchmark to be representative of a guided missile program used for design studies. It's not listed here for space reasons—not physical space, but the space that appeared between my ears when I attempted to decipher it. Suffice it to say that Flight contains plenty of arithmetic calculations as well as all the trigonometry you could hope for.

Dropping back in time to another old benchmark, we find David Ahl's Simple benchmark from the January '84 issue of *Creative Computing*. Translated into COMAL 0.14, the meat of this test looks like:

```
0100 R:=0
0110 S:=0
0120 FOR N#:=1 TO 100 DO
0130 A:=N#
0140 FOR I#:=1 TO 10 DO
0150 A:=SQR(A)
0160 R:=+RND(1)
0170 ENDFOR I#
0180 FOR I#:=1 TO 10 DO
0190 A:=A^2
0200 R:=+RND(1)
0210 ENDFOR I#
0220 S:=+A
0230 ENDFOR N#
```

This benchmark tests for mathematical accuracy by taking the square root of A, then squaring the result and adding it to the variable S. Perfect accuracy would result in S equaling 5050 at the end of 100 cycles through

### TECH NOTES

1) The COMAL Users Group claims version 2.0 is about twice as fast as 0.14. *COMAL Today* magazine #6, p. 17.

2) All the C-128 benchmarks were run in C-64 mode. COMAL 0.14 won't load in C-128 mode and the COMAL 2.0 cartridge forces the C-128 into C-64 mode on bootup.

3) If you own a C-128, you can kick your computer into its fast speed while in the 64 mode. Normally the C-128 in 64 mode operates with a 1 MHz clock, but you can switch to the 2 MHz clock with POKE 53296,3 and reset to 1 MHz with POKE 53296,0. In the faster speed, the C-128 screen will go blank and internal computer operations will click along at twice the normal speed. (The corresponding hex address to 53296 is \$D030.) You can elect to just blank (not erase) the screen and take the modest speed improvement by POKEing 53265 with a 3 (off) and then a 0 (on).

4) The Sieve benchmark has been written other ways using division. It runs dozens of times slower. The moral? If you're looking for speed, don't throw out high-level languages; look for better algorithms. High-level languages are generally considered to save time in development and debugging. If you just have to have

more speed in your finished program, try rewriting the most critical routines in assembly language. Even then, don't throw out that high-level code—it may be useful documentation in the future.

5) Ahl's benchmark is, like the others, designed to give a specific comparison of processing speed. However, it also reports on the accuracy of the language and the computer at squaring the square root of a number and coming up with exactly the original number. At the end of the completed benchmark, it subtracts the original number from the one calculated by the computer. Presumably the closer to zero the better. Here are some interesting "accuracy scores":

COMAL 0.14	0.000298	COMAL 2.0	0.000117
BASIC 2.0	0.001041	BASIC 7.0	0.001052

6) No benchmark can be the sole criterion for you to use in judging a language. Sieve, for example, does not test features like recursion or sets, which are critical to some programming tasks. And benchmarks totally fail to show ease of programming. As Denaci wrote, "In comparing the five languages, there is no doubt that COMAL is superior, it is user friendly! BASIC isn't as difficult as the "compiled" languages,

the major loop. And the benchmark exercises the random (RND) function by adding a random number between 0 and 1 to the variable R a total of 2000 times. That's 10 times (line 140) plus 10 times (line 180) multiplied by 100 (line 120). The resulting value of R, based on probabilities, should be 1000, but the actual calculation doesn't mean much with the exception of testing execution speed.

### Rupert's "Benchmarks"

(Scored against BASIC 2.0)

	Addition (1 MHz / 2 MHz)	Multiplication (1 MHz / 2 MHz)
<b>COMAL 0.14</b>	1.07 / 1.06	1.05 / 1.04
<b>COMAL 2.0</b>	.64 / .64	.77 / .77
<b>BASIC 2.0</b>	1.00 / 1.00	1.00 / 1.00
<b>BASIC 7.0</b>	1.42 / 1.39	1.29 / 1.26

Next we'll borrow from the *Rupert Report* in the June 1987 issue of *Ahoy!* that showed BASIC's ability to perform 1000 additions or multiplications. Dale's test, converted to COMAL 0.14, is:

```
0100 A:=3.21896543
0110 B:=1.02104539
0120 POKE 160,0
0130 POKE 161,0
0140 POKE 162,0
0150 FOR N:=1 TO 1000 DO
0160 A:=A+B // ++ A:=A*B
0170 ENDFOR N
```

but it has the limitation of only recognizing the first two letters in variable names. Using compilers makes it difficult and time consuming to troubleshoot and edit a program."

7) If you choose to run these benchmarks yourself, you can get more accurate timing than is possible with a sweep-second hand or by counting one-thous-and-one. Use the computer's internal clock. If the language does not have a way to directly access the clock, like BASIC's TI\$ or COMAL 2.0's TIME, then use zero-page memory locations 160-162 (\$A0-\$A2). POKE them with zeros just before the main body of the benchmark and calculate the time at the end with:

```
PRINT (256*256*PEEK(160)+256*PEEK(161)
+PEEK(162))/60
```

8) For more reading on benchmarks, try: "Leaks Like a Sieve," *Byte*, 8/85, p. 33; "Benchmarks," *Byte*, 8/85, pp. 132-3; Gilbreath, J., "A High-Level Language Benchmark," *Byte*, 9/81, pp. 180-198; Knuth, D., *The Art of Computer Programming Vol 2: Semi-Numerical Algorithms*. Reading MA: Addison-Wesley, 1969; Ahl, D., "Creative Computing Benchmark," *Creative Computing*, 1/84, p. 5.

```
0180 PRINT (256*256*PEEK(160)+256*PEEK(1
61)+PEEK(162))/60,
0190 PRINT " SECONDS"
```

Finally, let's return to Son of Sieve and I'll get around to answering Robert Boomers' question about COMAL's speed. He sent the following BASIC program that computes the first 1000 prime numbers.

```
10 TI$="000000":DIMY%(8000):P=1:C=0
20 PRINTP,:C=C+1:IFC=1000THEN50
30 P=P+1:IFY%(P)=1THEN30
40 FORX=PTO8000STEPP:Y%(X)=1:NEXT:GOTO20
50 PRINT:PRINTTI/60
```

Translated into COMAL 2.0, Boomers' benchmark reads:

```
10 TIME 0
20 DIM y#(8000)
30 p:=1; c:=0
40 REPEAT
50 PRINT p;
60 c:=c+1
70 REPEAT
80 p:=p+1
90 UNTIL y#(p)<>1
100 FOR x:=p to 8000 STEP p do
110 y#(x)=1
120 ENDFOR x
130 UNTIL c=1000
140 PRINT TIME/60
```

Boomers sent in times for BASIC 7.0 (1 MHz) and Abacus BASIC (MHz unknown), to which I've added a few:

### Son of Sieve

	1 MHz	2 MHz
<b>BASIC 7.0</b>	266 seconds	127 seconds
<b>BASIC 2.0</b>	209 seconds	102 seconds
<b>COMAL 0.14*</b>	197 seconds	95 seconds
<b>COMAL 2.0</b>	99 seconds	48 seconds

\*COMAL 0.14 is short on program memory (under 10K), so times are estimated based on a benchmark to find the first 725 primes. \*\*This "run" time does not include the extra step of compiling the program.

So, what do all these numbers mean? You're free to draw your own conclusions. To me they say that COMAL 0.14 is often an improvement over BASIC (in speed, that is; in other ways, it's always an improvement). And COMAL 2.0, depending on your programming application, can have your C-64 running at C-128 "turbo" speeds. You're free to draw your own conclusions. Let me know what they are at P.O. Box 1544, Tallahassee, FL 32302. □

# TOMB OF HORROR

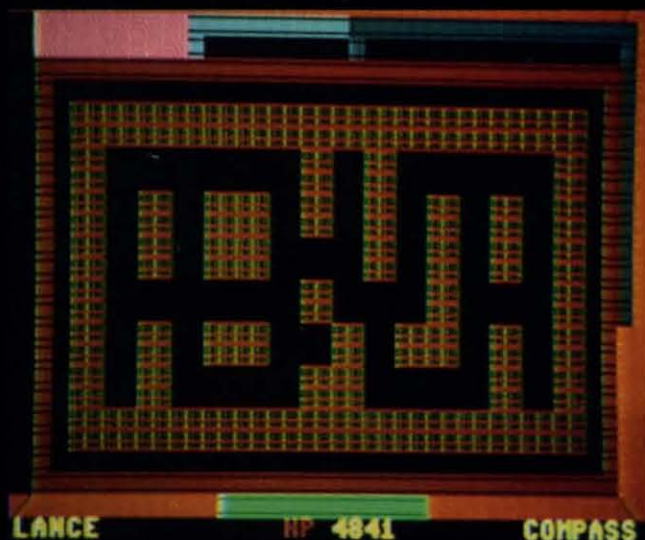
## The Ultimate 3-D Adventure for the C-64

By Cleveland M. Blakemore

**A**t the farthest corner of the earth, beyond the barren wasteland, lies the Tomb, abode of the hideously evil Demon King and the hordes of darkness. The Demon's greatest treasure is the Alchemy Stone, an artifact from the ancient world that transmutes matter itself.

Your task is to retrieve the Alchemy Stone (along with all the treasure you can gather) from the nether regions and escape from the *Tomb of Horror* into the light of day.

This is the third (and final) entry in my trilogy of 3-D games. It evolved out of *Crypt of Fear* (Feb. '88 *Ahoy!*), which in turn was inspired by *Vault of Terror* (Oct. '86 *Ahoy!*). I like to think I've outdone myself, but you will ultimately be the judge of that.



This game is a real-time three-dimensional dungeon adventure that utilizes page-flipping animation, multiple sprite shapes, pull-down windows with joystick-controlled menus, and thirteen different creatures. It has three separate levels, five different kinds of traps, nine different types of weapons, five types of armor, and thirty individual objects that can be held, examined, or used in some way. It also features high quality graphics in color, thanks to extended background mode. The game has complex algorithms for combat, taking into account the type of creature you are fighting, the type of armor you have on, what type and quality weapon you are using, and how strong you are as a fighter.

In order to squeeze this program into a measly 68 blocks on disk, I had to throw all frills to the wind. Although it



originally had an attractive title screen and a redefined character font, I had to take these out because of space limitations. In order to assure that the program quality did not suffer one iota, I also had to keep the sound effects to a minimum. I doubt if these deletions will be missed. (Ed. note: the July *Ahoy!* Disk contains an expanded version of *Tomb of Horror*, complete with redefined graphics and enhanced title screen. See page 52 for ordering information.)

The program is entirely joystick operated. You will never have to touch the keyboard after typing RUN. All commands are entered through a convenient system of pull-down



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menus that erase themselves after use. The commands are simple and straightforward, requiring very little explanation.

To move forward in the dungeon, push the joystick forward. The word "MOVE!" will appear at the bottom of the screen, there will be a slight pause, and you will be standing one block forward from where you were. To turn left, move the joystick left. To turn right, move the joystick right. To move back, pull the joystick back.

If the block you are standing in has anything in it, the bottom line of the screen announces it at the left. If there is a monster in the block with you, the bottom line tells you at the far right.

To access the main menu, you must be standing in a block not occupied by a monster. To pull the menu down, push the fire button and simultaneously pull back on the joystick. The menu appears in blue on the screen, with a selection of thirteen commands to choose from. No creature can attack while you're in the menu.

You can move from one selection to another by moving the highlighted choice in white with the joystick. Push the fire button to select.

The thirteen commands in the main menu are TAKE, DROP, LEFT HAND, RIGHT HAND, ARMOR, ASCEND, DESCEND, EXAMINE, INCANT, QUAFF, SEARCH, INVENTORY, and EXIT MENU. The last erases the main menu window and returns you to real time adventure in the dungeon. Otherwise, you can push the fire button whenever you are finished reading a message or looking at a sub-menu display window, in order to close it and return to the main menu.

TAKE and DROP allow you to pick up and dispose of objects for your inventory. TAKE automatically picks up whatever is in the block with you, providing you do not already have one. DROP allows you to select from one of the four classes of objects you can carry, which read on the sub-menu as WEAPON, ARMOR, SPECIFIC ITEM, and TREASURE. The last entry is EXIT MENU, in case you change your mind and need to escape from the sub-menu.

LEFT HAND allows you to locate a weapon from your inventory and place it in your left hand, your fighting appendage. RIGHT HAND allows you to hold an object from the SPECIFIC ITEMS menu of your possessions. ARMOR permits you to select what you will be wearing. Remember, if you have not selected it from the menu, you are empty handed, no matter what you may be carrying. It is possible to be beaten to death by a flying bat if you have a bazooka in your inventory but have not placed it in your left hand so that you can fight with it.

These commands are very versatile, and many of them are interrelated. You must be holding the compass, for instance, in order to know what direction you are facing.

ASCEND and DESCEND allow you to do just that, if you come across a shaft. You'll need a rope and a steel grappling hook before you can climb up or down.

EXAMINE is also a very versatile command, which you use to look closely at an object in the inventory. You can compare weapons and armor and see which is of better quality. For example, although common sense might dictate that a hand axe would be a better weapon than a dagger, a dagger of excellent workmanship would probably be superior

to a hand axe of mediocre or common workmanship. It is left to the discretion of the adventurer. Other objects can also be examined, with various results. I'd like to leave secrets for the player to discover, rather than spoil the fun.

Anything that can be held in the right hand can be INCANTed, which means calling upon its mystical or arcane properties. Don't expect much from INCANTing a compass, but you might try INCANTing suspicious items like the mithril ring (assuming you are in the right locations). INCANT has different effects, depending on the artifact.

QUAFF means to take a swallow of healing elixir, which you carry in one pint servings. It gives you strength for battle and may save you life at an opportune time.

SEARCH looks for traps four blocks forward of your current location. Use this command frequently, or you'll find yourself falling into spiked pits, getting impaled on spears, and becoming tangled in tripwires. Your adventure will be cut short quickly if you are not cautious.

INVENTORY prints out four windows displaying everything you have.

Remember, your long-term goal in the *Tomb of Horror* is to acquire the Alchemy Stone, and all the options on the menu can assist you toward this end one way or another.

Once you have obtained the Alchemy Stone, return to the surface world by ASCENDING through the shaft on the first level in the far northwest corner, and win the game.

I'm certain the game will provide you with hour after hour of entertainment. The quickest game I've played successfully required 45 minutes to get the Stone and return to the upper level.

The whole window system used in *Tomb of Horror* would not be possible without the use of Shawn K. Smith's clever memory move command from the June '87 *Tips Ahoy!*, which uses the built-in ROM routines to stash and save text and color information in a buffer above BASIC memory set aside for the purpose. My thanks to Shawn for the use of his short ML tip.

The game is in two parts: a BASIC section and a binary file. Be certain that the *Flankspeed* file is named correctly so that the main program can load it into memory.

*Tomb of Horror* contains numerous shifted spaces which must be typed in correctly, because the program uses extended background mode and requires shifted characters to generate different colors. Be especially careful when typing in the game.

Giving credit where credit is due, I'd like to pay tribute to the game *Dungeons of Daggorath* for the Tandy TRS-80 as the driving force that compelled me to create my own 3-D games for the C-64. Ever since I saw this game back in the summer of 1985, I've been striving to create a 3-D game as good or better.

If you think I succeeded, or failed miserably, please let me know. I sincerely enjoy reading mail, both critical and flattering, and would like to hear what all *Ahoy!* readers think of *Tomb of Horror*, or any other games I've created in the past. Hearing the voice of the readers gives direction to my efforts. If you would really like to see "just one more" 3-D game, or hope I'll never waste so much magazine space again, let me know, c/o *Ahoy!* You might see one of your suggestions incorporated into a game in the future! □

SEE PROGRAM LISTING ON PAGE 72

# ENTERTAINMENT SOFTWARE SECTION

Continued from page 23

an aircraft carrier! Better still, *Jet* interfaces with the entire library of *FS Scenery Disks* (as does this new program), so computer pilots can wage contemporary high-speed air combat over just about any city on Earth.

*Stealth Mission*, written by Steve Setzler and "directed" by Bruce Artwick, represents the latest wrinkle in the ongoing saga of the software Icarus. Unlike *Jet*, it does not contribute a quantum leap forward in terms of design. Technologically, however, it pushes the Commodore 64/128 envelope well beyond the blue horizon, to a whole new level of animation and frame rates.

The visual integrity in all cockpit displays is absolutely incredible. The program never freezes in order to load new data, but rolls smoothly with the exception of occasional color flip-flops.

The emphasis here is not so much on the simulation as on the flight and combat elements. The fact is, the aircraft being simulated here—F-19 Stealth Fighter, Navy F-14 Tomcat, and the experimental forward-swept wing X-29—could probably be flown by chimpanzees. These aircraft do everything but reproduce themselves. SubLOGIC made the design almost idiotproof. Single button commands allow the fighters to locate and rendezvous with a refueling plane. There's even an auto-landing feature. All this flight lacks is Coca-Cola in the cockpit.

*Stealth Mission* offers eight scenarios, selected from an onscreen menu. These missions range from easy to intermediate to advanced, and include a mountain conflict, a battle at sea, a marathon bomber scenario, and a visually appealing mission in which the air combat occurs over a collection of ancient ruins.

A second screen allows the user to set difficulty (0-9), select an aircraft, and choose its armament (Sidewinder, Sparrow, and Maverick missiles, four kinds of bombs, AGM-84 Harpoon, air-to-air and air-to-ground Stealth missiles, and an M61 cannon).

Instrumentation includes all the standard items (HUD, air speed indicator, altimeter, fuel level, thrust, clock, brake and landing gear status, altitude indicator, etc.). There are also navigational aids (ADF receiver and bearing indicator, VOR receiver and omnibear-

ing indicator, DME and ILS glide-slope needle) and weapons/defense controls (damage indicator, radar, target-tracking computer, ECM, weapons select, etc.).

The controls will seem immediately familiar to anyone who's ever used a flight simulator (or, heck, even a real jet): throttle, elevator, aileron controls, airbrakes, landing gear, etc. *Stealth Mission* also allows for joystick control of flight operations.

In addition to the standard *FS/Jet* options (multiple viewpoints, zoom, control tower view, spotter plane), this program adds a "missile's eye view" to intimately track the killer projectiles as they zoom toward a computer-locked target.

Is *Stealth Mission* exciting? Yes, but not as exciting as it should be. The problems are almost intrinsic to the crafts being simulated. They are easy to fly and the onboard computers stabilize them quickly when danger approaches. As a result of all this convenience, the player doesn't have much to do for long stretches of time. The upside, of course, is that users are free to concentrate on combat. However, these air battles have a cold, somewhat antiseptic feel. Instead of simply lining up a target in your sights and blasting away, the computer must be locked on before a weapon is discharged, and that won't happen until the target is within range.

The weaponry is impressive as all getout, with a choice of 11 different missiles, bombs, and cannon, but the results are less than satisfying.

With all the visual marvels SubLOGIC produced for this game, it's a shame more time wasn't spent simulating the results of the warfare. Explosions are nothing special, from either a visual or audio perspective, and we aren't even treated to the sight of an enemy aircraft crashing in flames!

The overall package, however, is excellent. The game comes with maps, extensive and well-written documentation, and a quick-reference card. *Stealth Mission* is an incredible programming accomplishment that deserves (and will doubtless have) the attention of anyone interested in the state of the combat flight simulation art.

SubLOGIC Corp., 713 Edgebrook Dr., Champaign, IL 61820 (phone: 217-359-8482).

—Bill Kunkel

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Why type in the listings in this month's *Ahoy!* when we've done it for you? All the programs in this issue are available on the current *Ahoy! Disk* for \$8.95. Isn't your time worth more than that?

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We've collected *Ahoy!*'s best programs onto the Anthology Disks described here.

Please note that many of these programs will be unusable without the documentation printed in the issues of *Ahoy!* listed in parentheses.

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**geoCALC 128**  
**Berkeley Softworks**  
**Commodore 128**  
**Disk; \$69.95**

Berkeley has been busy evangelizing the Commodore world on the benefits of their Graphic Environment Operating System (GEOS). Part 2 of that mission has been to provide a bevy of applications which utilize the power of the icon. With that in mind they have released a series of C-128 products which take advantage of the machine's inherent advantages over the 64.

One of those releases is *geoCalc 128*, the graphic interface spreadsheet which accepts worksheets produced by its C-64 counterpart. This copy protected disk requires *GEOS 128* version 1.2 or later, a 128, an 80 column RGBI monitor, a joystick or a mouse, and a disk drive (1541 or 1571).

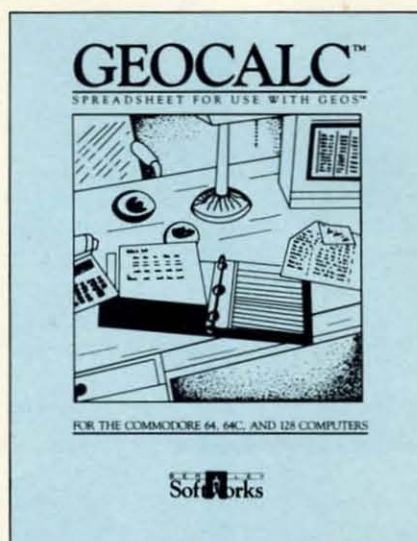
Optional equipment includes a printer, a second disk drive, and a 1750 RAM Expansion Unit (REU). Everyone understands the benefits of a printer and a second disk drive—hardcopy and increased file efficiency—but the REU is another matter. With it, spreadsheets recalculate faster, and larger spreadsheets are possible; therefore less time is spent waiting. That's the whole reason for using computers in the first place.

## The Basics

Though copy protected, the application provides a way to make backup copies, the actual work disks. As with most things *GEOS* it is usually best to stay with the routines provided on the disks, whether you're duplicating entire disks or merely copying files.

*gC* allows a worksheet of up to 256 rows by 112 columns for a cell capacity over 28,000. It provides 12 digit accuracy for addition, subtraction, division, multiplication, and percentage calculations, and 9 place accuracy for trigonometric, exponential, logarithmic, and financial (present/future values, etc.) operations. Up to 200 characters can reside in a single cell.

Almost half of the menu options have keyboard alternatives; the screen display is logical and well-executed.



*Useful for light duty jobs at best.*  
**READER SERVICE NO. 177**

Cell widths can be changed from 3 to 31 characters, with 12 being the default. Relative and absolute references are supported, as are named ranges and the ability to copy, cut, clear, or paste data (and functions) within a sheet.

Just over a dozen display formats are available (\$0.0, 0.00, 0.0000, for example); and information can be imported or exported to other *GEOS* applications via the scrap function. Alphanumeric alignment functions include centering in a cell, and left or right justification. Character attributes can be displayed and printed as italic, bold, bold-italic, or plain.

## Advanced Features — Somewhat

*geoCalc 128* handles functions such as ATAN (arctangent), COS (cosine), LOG (logarithm), RAND (random), SIN (sine), SQRT (square root), and TAN (tangent), among others. These, and the other 16 functions, represent the best the program has to offer, mathematically speaking.

*gC* does make use of the 128's uniqueness—somewhat. The numeric keypad is supported; likewise, its ENTER key functions the same as the RETURN key. The individual cursor keys work, but the function keys are sorely neglected. So is the NO SCROLL key and the HELP key. (There is no on-line help, and judging from the condi-

tion of my manual, there should be.)

The ability to access an REU's extra memory is excellent, however, as are the numerous ways (five!) to move the cursor about the worksheet.

Entire rows or columns can be selected by clicking on the row or column's alphabetic or numeric label. That is, all the cells in column B can be highlighted (ranged) by moving the cursor over the "B" and clicking the left mouse button. The same applies to numeric rows.

## Manual Amnesia

The Dr. Jekyll/Mr. Hyde mix continues as the manual covers both the 64 and the 128, with 128-specific info noted in highlighted boxes. But all the screen illustrations, and there are plenty, are from the 128 version.

Chapter 3 is a tutorial of sorts. Chapter 4 continues the process in greater depth until, in my manual anyway, page 4-6 is reached. That's where Chapter 4 ends abruptly. Full explanations of the "advanced" functions and other bits of information are supposed to be on pages 4-7 to 4-41, give or take a page or two. (Supposed existence of the other pages was revealed by scanning the index for the whereabouts of information concerning the trigonometric functions.)

An outright error is displayed in the screen graphic on page 4 in Chapter 3. A call-out arrow points to the checkmark entry icon, calling it the text entry cursor. The cursor is nowhere to be found, further confusing the issue and making it more difficult to determine the true state of affairs.

## Other Anomalies

Some functions are only available via the keyboard, a strange turn of events considering the entire reason this program exists—a graphic interface with icons and pulldown menus.

One such option is the cancel command, useful to abort an incorrect procedure or calculation; the other facilitates marking large chunks of cells for range manipulations. Both are important by any standards.

The fact that there are two data win-

dows available is nothing new either. Many spreadsheets have the ability to split a display into an active and an inactive window, and then scroll through the active one. *gC* only allows horizontal splits—that's like building half a house.

To install *geoCalc 128* with a 1571 drive, the software resets it to act as a 1541. While the procedure is noted in the manual, the need for this kind of manipulation lends credence to the belief that *gC 128* is nothing more than a warmed over *gC* for the 64. That would be okay if all of the 128's unique features were addressed, but they're not.

The program is described as being "intelligent," a phrase usually reserved for spreadsheets which use a sparse memory matrix to recalculate only cells containing entries. This method produces faster results; however, it is not supported by *geoCalc 128*. Nowhere is the term "intelligent" properly described or explained.

After making a big to-do about the high quality of the printed output, it seems strange that the Apple Laser-

Writer is not supported. After all, several other *GEOS* products include drivers for this standard setting printer. Lack of a device driver for this high-end printer muddies the water over the true level of the program's "presentation" quality printing.

## How Does It Add Up?

*geoCalc 128* is a fine concept, but it has very little mathematical muscle. It cannot import other spreadsheet files (beyond those from the C-64 *geoCalc*); it does not support truly advanced features and functions (macros, conditional searches, etc.); and the manual is erroneous and incomplete.

Its prime attraction is *GEOS*'s graphic, intuitive interface. This "window on the world" provides extreme ease of learning, a comfortable feeling if you're already familiar with *GEOS* programs, and ease of use.

Unfortunately, in this case, that is not enough. Mice, pulldown menus, and icons do not make a program; they are merely tools which drive or feed an application. The software must do some-

thing substantial, must provide a cost-effective solution to a need. In those regards, *geoCalc 128* is not much more than a pretty face. At best, it is useful for light duty jobs.

Berkeley Softworks, 2150 Shattuck Avenue, Berkeley, CA 94704 (phone: 415-644-0883). —*Ted Salamone*

## TISAR 128 CW Data Labs Commodore 128 Disk; \$89.95

The first thing you should understand about *TISAR 128* is that *TISAR* is an acronym that stands for Total Information Storage And Retrieval. Having that as its name and its apparent goal, you'll probably guess that it is a database. More than that, however, it is a database that has been optimized for small business use—one that will create and print point-of-sale invoices, database records with monthly or yearly totals of accounts received and receivable, and a perpetual inventory based on sales.

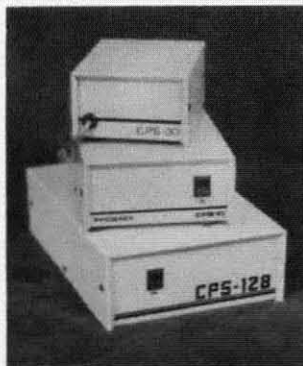
As such, it is one of the most powerful programs I've seen for the C-128, even though it will not have an audience as large as would be the case with a "free-form" relational database.

And for those who may despair because they've been told graphics are all but impossible in the C-128's 80-column mode, we'll point out that *TISAR 128* uses them almost to a fault: simple graphics, true, but eye-catching, as is their intent.

Although it is possible to pick one or another section of *TISAR 128* and use it exclusively, the heart of the system as designed is the database. Since we must use the Commodore 1571 disk drive with double-sided disks, it is possible to install the database program and up to 500 records on a single disk. (Almost necessary for efficiency, since *TISAR* supports only one drive.)

Depending upon whether your business is sales/service or sales/marketing, you'll pick the appropriate program for the job. *TISAR 128* supplies you with two service disks and one marketing disk. With no ability to edit or customize database fields, it is important that variations are provided, but you may still have to bend your current record-keeping methods to fit.

Fields provided are for name, address, phone, part number, remarks,



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# An open letter to the readers of Ahoy Richard Olsen President: The Ennon Corporation

My purpose in writing is to ask you to join me in shaping the future of the new and most unusual field in computer technology today: Artificial Intelligence.

This incredible power and spectacular creative potential are available to you, for your computer right now. However, there is an alarming possibility that such amazing technology which you have every right to, may not be available to you other than through this offer.

This is unfortunate but somewhat understandable due to the way technology is created. You see, only the business oriented corporation can finance research. It therefore is in a position to dictate immediate research goals. These goals are increasing profits through more efficient production. While valid, they are merely creative and do absolutely nothing to foster exploration in new applications. The results: technology is never used to its fullest potential. But what's worst of all is that these competitive corporations have absolutely no desire to share technology with each other, let alone with you. So, they don't. As a result, the infinitesimal amount of technology that finally trickles down to you is:

- A. So expensive you are prohibited from procuring it
- B. Shamefully inferior to the real thing

remember...you can buy high-tech consumer goods, but never the technology that creates it.

This same situation confronts you in the new Artificial Intelligence field, but with a difference: There is no *true* Artificial Intelligence for the home computer user! The few programs claiming to be Artificial Intelligence are really simulators. They are not the real thing. Possessing a mere token of the power and versatility, simulators are clearly not worth their expensive price.

I have tried repeatedly to convince my colleagues that it is in their best interest to release genuine Artificial Intelligence to the general public. The refinement, modification and adaptation as individuals create new applications would improve Artificial Intelligence tremendously.

This would benefit *everyone* in the long run.

I have met with little success. Apparently, it seems that immediate corporate profit is more important than sharing technology with the public. Therefore, the Ennon Corporation stands alone in offering superior Artificial Intelligence programming directly to the home computer enthusiast.

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estimated price, deposit, and COD. If, for example, an item is purchased for \$500.00 and a deposit of \$100.00 is made, the larger amount is entered as Estimate. COD entries occur only when the balance is received. In this way, *TISAR* allows you to see at a glance the amount of money received for a particular period (month or year) as well as money owed you for that same period.

It does this through one of the many search features—records can be searched on any field and printed or displayed. Additionally, there is a cross-search feature which allows sorts on multiple fields. As an example, if you wanted to know how many people named Smith had bought widgets during the month of March, you could.

In screen displays, *TISAR* will present the records in a scrolling form with outstanding amounts highlighted in red, or as a bar chart in which the amounts received will help you to get a handle on the month-to-month ups and downs of your business.

Unfortunately for its stated use as a point-of-sale invoicing system, a database record must be created before an invoice can be filled out. While this would be fine if all customers were repeat customers—and thus a database record on each already existed—I feel that here the long process would slow things to the point that you'd be losing customers. As an alternative, there might be some value in using *TISAR* as a "back-room entry" system, where the true accounting is done after the sale and the invoice would be mailed to the customer simply as a confirmation of the transaction.

In beginning an invoice, you would first probably choose to customize it by having the printed copy show your business name, address, and phone number. As is the case with each of its many routines, *TISAR* will prompt you for each separate entry, and many times will do this by creating a flashing window on the screen.

Following this is a section for printing your company's guarantee or any other message you may need to impart: "No refunds after ten days," "Repairs left over thirty days," etc.

The invoice form itself will depend upon whether your business is sales and marketing or sales and service. As it does with the databases, *TISAR 128*

provides a different invoice for each type of business. When dealing with invoices—as opposed to database records—it is necessary to have several formatted disks on hand. Each disk will hold 125 invoice records, and this in spite of the fact that they are double-sided disks formatted in the 1571 drive.

At the point of sale, enter the customer name; quantity, part number; description of goods or services; price per unit; sales tax rate (or tax exempt); and the amount of deposit or payment. All this is in answer to screen prompts, and fields that do not apply can be avoided by entering "0". Once all entries have been made, the invoice, complete with subtotal, total, deposit, and balance will be printed to the screen and can be sent to your printer, where the heading and guarantee messages will also be printed.

The third part of the system is called *TISAR ICM*—Inventory Control Module. With this, you can store records of up to 1000 individual items on a disk, and there are fields for adding to stock as new merchandise is received or deleted from stock as items are sold.

To accomplish the latter, *ICM* will process the invoice data disks, reading the items sold and subtracting them from inventory, allowing you a much better feel for the pulse of your business—allowing you to know what items are selling, when they are selling, and the rate of movement. In addition, each item can be keyed to a reorder point: when only 50 widgets are left in inventory, it is time to order more.

With selective display and printing options, the *ICM* module will allow you a look at all inventory items or only those that have reached the reorder point.

There is no doubt that *TISAR 128* can be of value to small businesses in helping them to gain better control of the record-keeping and inventory processes, but it does have shortcomings.

First, with the number of disks and programs involved, it should have been written for use on a hard disk or, at the very least, to support two disk drives. Second, it is a bit too cumbersome to be used as a point-of-sale system, though this could have been alleviated by turning the program around. If the database were created from the invoice, it would be a much faster system.

*Continued on page 81*

# COMMODARES

## PROGRAMMING CHALLENGES

By Dale Rupert

**E**ach month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o Ahoy!  
P.O. Box 723  
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

### PROBLEM #55-1: SIG DIGS

This problem was submitted by Jim Speers (Niles, MI). Write the shortest program which accepts any integer from 0 to 32767 and prints out the number of 1's in its binary representation. The title of this problem comes from the more advanced challenge which is to accept any whole number from 0 to 65535 and print out the number of 1's, significant 0's (ignore leading 0's), and total number of SIGNificant DIGits in its binary representation. (Jim thinks that this second challenge cannot be done in one line.)

For example, if the user enters 65, the computer responds "2" for the first challenge, since the binary value of 65 is 0100 0001 which contains two 1's. For the second challenge, the computer responds "2, 5, 7" since there are two 1's, five non-leading 0's, and seven significant digits.

### PROBLEM #55-2: RAPID RANDOMIZER

Try this one from Justin Smalley (Boulder, CO). Start with the following array definition:

```
10 N=100 : DIM X(N): FOR I=1 TO N: X(I)=  
I: NEXT
```

Write the rest of the program which will rearrange this array in random order as quickly as possible. Add line 20 to start the timer and line 40 to stop the timer and print the time required to shuffle the array.

```
20 T0 = TI
```

```
40 PRINT TI-T0 "JIFFIES"
```

Start your solution at line 30.

### PROBLEM #55-3: UNJUMBLED WORDS

Eddie Byrd (Ste. Genevieve, MO) wants to see every possible combination (or permutation) of the letters of any five- or six-letter word entered by the user. He wants his computer to help solve those scrambled-word puzzles in the newspaper. Can you help? (Readers with a good collection of *Ahoy!* back issues may not have much trouble with this one.)

### PROBLEM #55-4: POLAR GRAPHICS

This one from Thomson Fung (San Diego, CA) should not be too difficult if you have a C-128 or use *Simon's BASIC* on the C-64. Very simply, write a program to plot a graph of the equation

$$R = 10 * T * \cos(T) * \sin(T)$$

in polar coordinates. Here R stands for the distance of each point from the origin. T represents the angle of a line from the origin to the given point. If you let T go from 0 to 25.2 in steps of 0.1, you will be rewarded with an interesting butterfly.

First of all I must confess to a blunder regarding the discussion of *Problem #48-4: More Income* in the April issue of *Ahoy!* The problem was the math classic where you are given the option of receiving \$15000 per year under one of two plans. Plan A gives a raise of \$750 every six months. Plan B gives a raise of \$3000 every year. The challenge was to write a program to display the annual and cumulative pay for the two plans. I chastised the readers for their confusion on this problem, since it seemed that most people misinterpreted it.

Fred Simon (Lindenwold, NJ) sent me a letter stating that my readers were not the only ones confused. Although I disagree with Fred's interpretation of the problem, it caused me to rethink the whole situation. Here (I think) is the proper answer to the problem. Plan A is better if you work for just one year; otherwise Plan B is better. (I originally said that Plan A was significantly better overall, contrary to common sense.)

Analyze it this way. Every six months, Plan A increases your base annual salary (BAS) by \$750. Your pay for any six month period is the current BAS divided by two. For example, your BAS for the first six months is clear-

ly \$15000, and your six months' salary is \$15000/2 or \$7500. Everyone agrees on that.

At the end of six months, your BAS goes up to \$15750, so your pay for the second six months is \$15750/2 or \$7875. Your total first-year earnings are \$15375 (\$7500 + \$7875). After one year, your BAS is raised another \$750 to \$16500. You earn \$16500/2 (\$8250) for the first six months of the second year. Then your BAS is raised to \$17250, and you get \$17250/2 (\$8625) for the fourth six-month period. Your total over two years is \$32250.

With Plan B, your BAS is \$15000 for the first year, and that is what you receive. Your BAS is raised to \$18000 which is your second year's salary. At the end of two years, you have accumulated \$33000. Plan B income is ahead of Plan A income by the middle of the second year.

Here is Fred's program adapted slightly to agree with this analysis.

```

• 1 REM =====
• 2 REM   COMMODARES PROBLEM #48-1 :
• 3 REM   MORE INCOME
• 4 REM =====
• 10 PRINT"YEAR SALARY A TOTAL[3" "]SALARY
    B TOTAL"
• 20 BAS=15000: SA=BAS: SB=BAS: TA=0: TB=0
• 30 RA=750: RB=3000
• 40 FOR YEAR=1 TO 10
• 50 TA=TA+SA/2+(SA+RA)/2
• 60 TB=TB+SB
• 70 PRINT YEAR;TAB(5);"$"SA;"$";TA;
• 80 PRINT TAB(22);"$"SB;"$"TB
• 90 SA=SA+2*RA: SB=SB+RB: NEXT

```

SA and SB are the BAS for Plan A and Plan B. TA and TB are the cumulative totals.

An interesting aspect of this problem is that Plan A is a better plan if it offers semiannual raises of \$1500 as opposed to Plan B's annual \$3000 raise. RA in the program is the amount of Plan A's raise. In fact, if you work for less than eight years, you would be better off with Plan A if it offered increases of only \$1400 semi-annually. (Can anyone figure out the break even point, that is, the amount of Plan A's increase which is equivalent to Plan B?) Experiment with the values and see what you come up with. Thanks to Fred for helping to straighten this out. My apologies to anyone else whose solution was correct the first time around.

Now on to new business. We will look at the best solutions to *Commodares* in the February issue of *Ahoy! Problem #50-1: Phone Decode* was submitted by Pat McConville (Manassas Park, VA). The user inputs a sequence of two-digit numbers representing letters encoded according to the telephone keypad. The computer decodes the numbers into letters. The first digit is the keypad number. The second digit is the letter's position on that key. Since "D" is the first letter on the number 3 key, its code value is 31. "Q" and "Z" are not on the phone keypad, so they are assigned 77 and 99 respectively.

Here is an interesting solution from Eddie Byrd (Ste. Genevieve, MO).

```

• 1 REM =====
• 2 REM   COMMODARES PROBLEM #50-1 :
• 3 REM   PHONE DECODE
• 4 REM   SOLUTION BY
• 5 REM   EDDIE BYRD
• 6 REM =====
• 10 A$="[20" "]"ABC[7" "]"DEF[7" "]"GHI[7" "]"
    JKL"
• 20 A$=A$+"[7" "]"MNO[7" "]"PRS[3" "]"Q[3" "]"
    TUV[7" "]"WXY[5" "]"Z"
• 30 INPUT A(1),A(2),A(3)
• 40 FOR X=1 TO 3
• 50 PRINT MID$(A$,A(X),1);
• 60 NEXT:PRINT:GOTO 30

```

Be careful typing the spaces in the definition of A\$ since each character's position in A\$ matches its encoded value. "D" is the 31st character in A\$, and "Z" is the 99th character. The MID\$ statement selects the chosen characters, one at a time. Eddie's method handles invalid numbers greater than zero by returning the space character. To avoid an Illegal Quantity error if the user just presses RETURN without entering a number, add this line:

```
45 IF A(X)=0 THEN 60
```

Don Wilkins (Burke, VA) transformed the numerical input into letters with the following formulas:

```

L = 3*INT((N-20)/10)
R = N-10*INT(N/10)
C = L+R-((L+R)>16)+6*(R=7)+5*(R=9)

```

N is the input number (20 < N < 100). The corresponding letter is printed with the statement

```
PRINT CHR$(64 + C)
```

Don's program first checked for valid inputs. The last two addends in the formula for C correct for the letters "Q" and "Z". Recall that if (R=7) is true, its value is -1. Consequently 6\*(R=7) subtracts six whenever R is seven. The middle term in the formula for C corrects all letters above "Q".

Ernest Barkman (Athens, NY) suggested *Problem #50-2: Short Sound*. The idea is to write the shortest program which will generate a continuous sound. Ernest's solution for the C-64 or the C-128 is shown in line 21 of the following program:

```

• 1 REM =====
• 2 REM   COMMODARES PROBLEM #50-2 :
• 3 REM   SHORT SOUND
• 4 REM   SOLUTIONS BY
• 5 REM   ERNEST BARKMAN      (LINE 21)

```

```

•6 REM      ERNEST BARKMAN SR. (22 & 23)*
•7 REM      BOB RENAUD          (24)*
•8 REM      KEVIN ESHBACH       (25)
•9 REM      WALLACE LEEKER      (26)*
•10 REM ===== (* = C-128 ONLY) =====
=
•21 POKE 54296,RND(1)*9:RUN
•22 PRINT CHR$(7): GOTO 22
•23 A=RND(1)*7+65:PLAY CHR$(A):GOTO 23
•24 PRINT"[CNTRL G]":RUN 24
•25 FOR I=54272 TO 54296:POKE I,RND(1)*255:NEXT I:RUN 25
•26 SOUND 1,999,1:RUN 26

```

Calling the output of this program a "sound" is about the most we can do. "Raspiness" might be a more appropriate term. Still, the program takes only 18 keystrokes (using abbreviations, ignoring spaces, and disregarding the line number and the RETURN at the end of the line), and Ernest's challenge was for brevity. Note that this program takes one more keystroke on the C-128 than on the C-64. Why? "P" SHIFT-O is POKE on the C-64, but it is POT on the C-128. Use "PO SHIFT-K" on the C-128.

This program randomly sets the volume of the sound generator. Why that should make a sound is not clear. Evidently this challenge generated some family rivalry. The solutions in lines 22 and 23 are from Ernest Barkman Sr. (Orlando, FL), either Ernest's father or else quite a coincidence.

Line 24 by Bob Renaud (Washington, MA) is an even shorter version of line 22. The CONTROL-G which beeps on the C-128 is entered in quote mode. Ignoring line numbers at the beginning and the end of the line, this program takes eight keystrokes using "?" for PRINT. This is undoubtedly the shortest program possible for solving the problem.

Not as short but producing more interesting sounds is line 25 from Kevin Eshbach (Sanatoga, PA). It POKES random numbers into various SID registers. It runs on the C-64 or the C-128. Wallace Leeker (Lemay, MO) sent the program in line 26. The sound is a pure tone with a slight discontinuity each time the program is rerun. Jim Speers sent a similar solution.

To run any of these, just type RUN followed by the appropriate line number. RUN 25 executes Kevin's program, for example.

Now for *Problem #50-3: Tricky Index* from Justin Smalley (Boulder, CO). The problem is to write line 30 to replace line 29 in the following program so that line 40 prints the index vertically in columns rather than in rows as line 29 does. The result is to have the same number of rows and columns as produced by line 29. Justin mentioned that such a routine can be handy for printing out an alphabetized array.

Jim Borden (Carlisle, PA) sent the following solution which takes advantage of the predefined variables. This allows his program to be easily modified for any number of columns NC and any value of L.

```

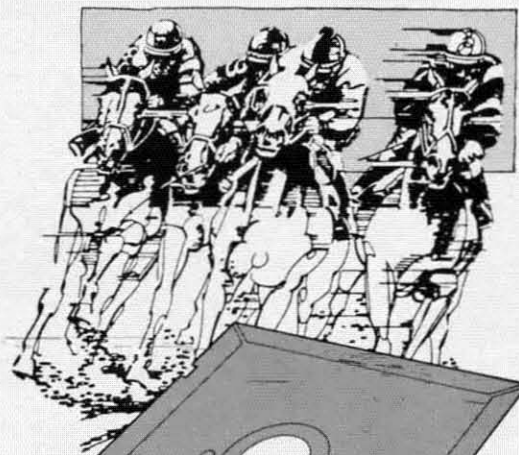
•1 REM =====
•2 REM      COMMODORES PROBLEM #50-3 :
•3 REM      TRICKY INDEX
•4 REM      SOLUTION BY
•5 REM      JIM BORDEN
•6 REM =====
•10 L=17: NC=5: NR=INT(L/NC)
•20 FOR R=0 TO NR: K=R*NC: FOR C=1 TO NC
•29 REM I=K+C: IF I>L THEN END :REM GIVEN
•30 E=1-(NC*NR-L):D=C-E:I=R+1+(C-1)*(NR+1):IF D>-1 THEN I=I-D:IF R=NR AND C=E THEN END
•40 PRINT I;: NEXT: PRINT: NEXT

```

Jim mentioned that E in line 30 should have been defined in line 10, but the *Commodore* allowed changes only to line 30. Do you see the disadvantage of defining E in line 30? In this program, E will be defined 18 times, even though its value never changes. You should not define a variable inside a FOR-NEXT loop unless its value changes within the loop.

Jim Speers suggested modifying line 40 so the results are printed in uniformly spaced columns. He used this statement on the C-128:

```
40 PRINT USING"###";I;: NEXT:PRINT:NEXT
```



# ALSOFT

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Bob Renaud converted the values to be printed into strings "padded" with spaces to give uniform columns.

Many readers had fun solving *Problem #50-4: Simple Simon*. The challenge was to write the simplest program possible to create the Simon number-sequence memory game. The computer briefly displays three numbers. The user must remember them and enter them in order. The computer then adds another number to the sequence and displays the four-number sequence briefly. The user must enter them in correct order. This process continues until the user fails to enter the list correctly.

This brief program from Judy Groth (Brooklyn, NY) solves the problem in only three lines.

```

1 REM =====
2 REM   COMMODARES PROBLEM #50-4
3 REM   SIMPLE SIMON
4 REM   SOLUTION BY
5 REM   JUDY GROTH
6 REM =====
7 DEFN R(S)=INT((RND(S)*9)+1):FOR X=1 TO 3
  A$=A$+MID$(STR$(R(S)),2,1):NEXT:PRINT
  A$
8 FORD=1 TO X*3:FOR X=1 TO 3:NEXT:PRINT"[CLEAR]":IN
  PUTB$:IF B$<>A$ THEN PRINT"SCORE="(X-4)*10
  ):END
9 X=X+1:A$=A$+MID$(STR$(R(S)),2,1):PR
  INT"  "A$:GOTO 7

```

Notice Judy's user-defined function in line 10. This function generates random integers from 1 to 9. This program keeps score, awarding 10 points for each digit in the last number entered correctly.

As if three lines were not short enough, Sharon Albers (Walters, MN) sent this nifty two-liner.

```

1 REM =====
2 REM   COMMODARES PROBLEM #50-4
3 REM   SIMPLE SIMON
4 REM   SOLUTION BY
5 REM   SHARON ALBERS
6 REM =====
7 X$=X$+RIGHT$(STR$(INT(RND(1)*10)),1):
  ON-(LEN(X$)<3)GOTO 4:PRINT"[CLEAR] [DOWN] [

```

## PROGRAMS WANTED!

We're always in search of the best game, utility, and productivity programs available for the C-64, C-128, and Amiga. If you've written a program which fits that description, send it on disk, accompanied by printed documentation, a program printout, and a stamped, self-addressed envelope to:

Ahoy! Program Submissions Dept.  
Ion International Inc.  
45 West 34th Street—Suite 500  
New York, NY 10001

DOWN][RIGHT][RIGHT]"X\$

```

11 FORT=1 TO 50:FOR X=1 TO 50:NEXT:INPUT"[CLEAR] [DOWN] [
DOWN]";I$:ON-(X$=I$)GOTO 4:PRINT"INCORREC
T -- "X$:END

```

X\$ holds the computer's number sequence. The first statement in line 10 picks a random digit, converts it into a string, and strips away the leading space. Another interesting aspect of Sharon's program is her use of the ON-GOTO statements. These allow the equivalent of IF-THEN conditional statements to be executed while having other commands follow on the same line. This is a handy procedure for the C-64 which does not allow the ELSE statement. A nice feature of this program is the final PRINT statement which shows the actual number which the user missed.

Some readers were careful to empty the keyboard buffer before accepting user input. This is to prevent cheaters from typing the numbers while they are displayed on the screen. (Of course, the real criminals would use pencil and paper.)

POKE 208,0 clears the keyboard buffer on the C-128. Use POKE 198,0 for the C-64.

The ultimate in brevity is this one-liner for the C-128 from Charles Kluepfel (Bloomfield, NJ).

```

1 REM =====
2 REM   COMMODARES PROBLEM #50-4
3 REM   SIMPLE SIMON
4 REM   SOLUTION BY
5 REM   CHARLES KLUPEFEL
6 REM =====
7 A=RND(-1):DO: A$="":DO:DO: A$=A$+CHR$(
  48+10*RND(1)):LOOP UNTIL LEN(A$)>2:PRINT
  "[CLEAR]"A$:SLEEP 1:INPUT"[CLEAR]";B$:LOO
  P WHILE A$=B$:PRINT"NO, IT IS":PRINT A$:GET
  KEY A$:LOOP

```

Charles said that this illustrates the power of BASIC 7.0. Indeed it does. You may better understand the logic of the program if you rewrite it, indented with one statement per line.

Hopefully you will enjoy improving your memory with these simple Simon solutions. Have fun working on this month's problems. Keep those solutions and suggestions coming. □

Congratulations to the following readers who have not been mentioned already this month:

Necah Buyukdura  
(Ankara, Turkey)

Harlan Clussman  
(Wausau, WI)

Oren Dalton (El Paso, TX)

Tameem Hallak

Terry Jernigan (Raleigh, NC)

Larry Louks (Freeport, TX)

Ron McManus (Lenore, ID)

Steve Morrison  
(Port Hueneme, CA)

Craig Morse (Minot, ND)

Jerry Nichols

Federico Oste (Loreto, Italy)

Myong Paek (Portland, OR)

Donald Pellegrini

(Arroyo Grande, CA)

Robert Rispoli (Ridge, NY)

Mark Roschke

Andrew Rosenthal  
(Flushing, NY)

# PROGRAM LISTINGS

**Attention new Ahoy! readers! You must read the following information very carefully prior to typing in programs listed in Ahoy! Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.**



In the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart

☛. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSOR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

**Call Ahoy! at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).**

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE	WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME	☛	[BLACK]	Black	CNTRL 1	■
[HOME]	Home	CLR/HOME	S	[WHITE]	White	CNTRL 2	□
[UP]	Cursor Up	SHIFT ↑ CRSR ↓	⬆	[RED]	Red	CNTRL 3	■
[DOWN]	Cursor Down	↑ CRSR ↓	⬇	[CYAN]	Cyan	CNTRL 4	■
[LEFT]	Cursor Left	SHIFT ← CRSR →	⬅	[PURPLE]	Purple	CNTRL 5	■
[RIGHT]	Cursor Right	← CRSR →	➡	[GREEN]	Green	CNTRL 6	⬆
[SS]	Shifted Space	SHIFT Space	■	[BLUE]	Blue	CNTRL 7	⬅
[INSERT]	Insert	SHIFT INST/DEL	■	[YELLOW]	Yellow	CNTRL 8	⏏
[DEL]	Delete	INST/DEL	■	[F1]	Function 1	F1	■
[RVSON]	Reverse On	CNTRL 9	R	[F2]	Function 2	SHIFT F1	■
[RVSOFF]	Reverse Off	CNTRL 0	■	[F3]	Function 3	F3	■
[UPARROW]	Up Arrow	↑	⬆	[F4]	Function 4	SHIFT F3	■
[BACKARROW]	Back Arrow	←	⬅	[F5]	Function 5	F5	■
[PI]	PI	π	π	[F6]	Function 6	SHIFT F5	■
[EP]	English Pound	£	£	[F7]	Function 7	F7	■
				[F8]	Function 8	SHIFT F7	■

# BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent*. You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

## C-64 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3".]":J
=49152
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
50 X=0:J=J+12:IFJ<49456THEN20
60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)":A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3".]":GOTO150
90 POKE49456,1:INPUT"DISK OR TAPE (D/T)":C$:IFC$<>"D"THE
ND=1:D$="TAPE"
100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)":N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME":F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)":B$:IFB$<>"Y"THEN6
0
160 POKE770,131:POKE771,164:SYS49152:END
170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500

```

## C-128 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3".]":J
=4864
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
50 X=0:J=J+12:IFJ<5213THEN20
60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)":A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3".]":GOTO150
90 POKE5213,1:INPUT"DISK OR TAPE (D/T)":C$:IFC$<>"D"THEN
D=1:D$="TAPE"
100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)":N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME":F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)":B$:IFB$<>"Y"THEN6
0
160 POKE770,198:POKE771,77:SYS4864:END
170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
200 DATA79,70,70,96,162,0,134,251,189,0,2,1053
210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339

```

# FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

*Flankspeed* will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name".1,1 for tape, or LOAD "name".8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1-SAVEs what you have entered so far.

f3-LOADs in a program worked on previously.

f5-To continue on a line you stopped on after LOADing in the previous saved work.

f7-Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program.

It temporarily freezes the output as well.

```

*100 POKE53280,12:POKE53281,11
*105 PRINT"[CLEAR][c 8][RVSON][15" "]"FLANKSPEED[15" "]";
*110 PRINT"[RVSON][5" "]"MISTAKEPROOF ML ENTRY PROGRAM[6" "
]"
*115 PRINT"[RVSON][9" "]"CREATED BY G. F. WHEAT[9" "]"
*120 PRINT"[RVSON][3" "]"COPR. 1987, ION INTERNATIONAL INC.
[3" "]"
*125 FORA=54272TO54296:POKEA,0:NEXT
*130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
KE54296,15
*135 FORA=680TO699:READB:POKEA,B:NEXT
*140 DATA169,251,166,253,164,254,32,216,255,96
*145 DATA169,0,166,251,164,252,32,213,255,96
*150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B
*155 GOSUB480:IFB=0THEN150
*160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16
*165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B
*170 GOSUB470:IFB=0THEN150
*175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16
*180 IFB>255THENB=B-255:POKE254,PEEK(254)+1
*185 POKE253,B:PRINT
*190 REM GET HEX LINE
*195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8
*200 FORB=0TO1:GOTO250
*205 NEXTB
*210 A$(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340
*215 PRINT" [c P][LEFT]";
*220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "
*225 FORA=0TO7:T=T+A$(A):IFT>255THENT=T-255
*230 NEXT
*235 IF A$(8)<>TTHENGOSUB375:GOTO195
*240 FORA=0TO7:POKEAD+A,A$(A):NEXT:AD=AD+8:GOTO195
*245 REM GET HEX INPUT
*250 GETA$:IF A$=""THEN250
*255 IF A$=CHR$(20)THEN305
*260 IF A$=CHR$(133)THEN535
*265 IF A$=CHR$(134)THEN560
*270 IF A$=CHR$(135)THENPRINT" ":GOTO620
*275 IF A$=CHR$(136)THENPRINT" ":GOTO635
*280 IF A$>"@ANDAS<"G"THENT(B)=ASC(A$)-55:GOTO295
*285 IF A$>"/ANDAS<"":THENT(B)=ASC(A$)-48:GOTO295
*290 GOSUB415:GOTO250
*295 PRINTA$"[c P][LEFT]";
*300 GOTO205
*305 IFA>0THEN320
*310 A=-1:IFB=1THEN330
*315 GOTO220
*320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1
*325 A=A-1
*330 PRINTCHR$(20);:GOTO220
*335 REM LAST LINE
*340 PRINT" ":T=AD-(INT(AD/256)*256)
*345 FORB=0TOA-1:T=T+A$(B):IFT>255THENT=T-255
*350 NEXT
*355 IF A$(A)<>TTHENGOSUB375:GOTO195
*360 FORB=0TOA-1:POKEAD+B,A$(B):NEXT
*365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535
*370 REM BELL AND ERROR MESSAGES
*375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415
*380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415
*385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41

```

```

OP 5
FP *390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
GOTO415
JP *395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415
FA *400 PRINT"?ERROR IN SAVE":GOTO415
*405 PRINT"?ERROR IN LOAD":GOTO415
AJ *410 PRINT:PRINT"END OF ML AREA":PRINT
ND *415 POKE54276,17:POKE54276,16:RETURN
NP *420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN
FL *425 REM GET FOUR DIGIT HEX
*430 PRINT:PRINTB$;:INPUTT$
FF *435 IFLEN(T$)<>4THENGOSUB380:GOTO430
EK *440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
380:GOTO430
KP *445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN
OE *450 IF A$>"@ANDAS<"G"THENT(A)=ASC(A$)-55:RETURN
AM *455 IF A$>"/ANDAS<"":THENT(A)=ASC(A$)-48:RETURN
PE *460 T(A)=16:RETURN
PG *465 REM ADDRESS CHECK
GM *470 IFAD>ENTHEN385
HG *475 IFB<SRORB>ENTHEN390
EC *480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395
ED *485 RETURN
KD *490 REM ADDRESS TO HEX
IH *495 AC=AD:A=4096:GOSUB520
IJ *500 A=256:GOSUB520
FA *505 A=16:GOSUB520
EG *510 A=1:GOSUB520
II *515 RETURN
GL *520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530
GI *525 A$=CHR$(T+48)
FL *530 PRINTA$:AC=AC-A*T:RETURN
IM *535 A$="**SAVE**":GOSUB585
PA *540 OPEN1,T,1,A$:SYS680:CLOSE1
GA *545 IFST=0THENEND
GO *550 GOSUB400:IFT=8THENGOSUB420
LM *555 GOTO535
IG *560 A$="**LOAD**":GOSUB585
HO *565 OPEN1,T,0,A$:SYS690:CLOSE1
HE *570 IFST=64THEN195
MI *575 GOSUB405:IFT=8THENGOSUB420
DJ *580 GOTO560
JA *585 PRINT" ":PRINTTAB(14)A$
PK *590 PRINT:A$="":INPUT"FILENAME";A$
FA *595 IF A$=""THEN590
BI *600 PRINT:PRINT"TAPE OR DISK?":PRINT
BB *605 GETB$:T=1:IFB$="D"THENT=8:A$="@"+"A$:RETURN
FA *610 IFB$<>"T"THEN605
BF *615 RETURN
FK *620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B
PH *625 GOSUB475:IFB=0THEN620
CP *630 PRINT:GOTO195
KH *635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B
OD *640 GOSUB475:IFB=0THEN635
OB *645 PRINT:GOTO670
LH *650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
OSUB410:GOTO195
BO *655 PRINT" ";:NEXTB
MB *660 PRINT:AD=AD+8
LM *665 GETB$:IFB$=CHR$(136)THEN195
JK *670 GOSUB495:PRINT" ";:GOTO650
PG

```

IK  
HK  
DM  
JK  
IO  
JO  
BF  
DH  
IM  
OL  
JD  
AK  
KB  
GM  
NJ  
IC  
OL  
HO  
LE  
OB  
HE  
PM  
AP  
NF  
LG  
HE  
JD  
OC  
JI  
AA  
IC  
AB  
FB  
PM  
FI  
PE  
PO  
OI  
CO  
GN  
KA  
IO  
HK  
HL  
NP  
KO  
PH  
DD  
NK  
HN  
FK  
LN  
HI  
LM  
LE  
CD  
JD  
KE

# VARI-SCAN FROM PAGE 30

## C-64 VERSION

```

•10 REM *** VARI-SCAN 64 *** BUCK CHILDRE
SS *** EB
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
9 *** OA
•30 PRINTCHR$(147)"LOADING AND CHECKING D
ATA LINE:";J=52000 BM
•40 FORB=JTO11:READA MB
•50 IFB=JTHENL=PEEK(64)*256+PEEK(63):PRIN
TCHR$(19)TAB(31)L:PRINT PF
•60 IFA<JORA>255THEN80 FK
•70 POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA
=XTHEN90 PL
•80 PRINT"ERROR IN DATA LINE:"L:END MG
•90 X=J:J=J+12:IFD<564THEN40 OO
•100 PRINT"THE DATA IS OK[3"."]":PRINT FB
•110 PRINT"SYS 52[3"0"] TO ACTIVATE[3"."]
":END AH
•120 DATA104,104,169,79,32,210,255,169,78
,162,57,160,1579 LA
•130 DATA203,142,0,3,140,1,3,32,210,255,7
6,179,1244 BP
•140 DATA204,173,0,2,201,95,208,17,169,79
,32,210,1390 JC
•150 DATA255,169,70,32,210,255,162,139,16
0,227,76,45,1800 GN
•160 DATA203,201,65,144,4,201,91,144,3,76
,139,227,1498 HP
•170 DATA32,96,166,162,0,160,0,140,85,205
,140,83,1269 OJ
•180 DATA205,189,1,2,240,47,48,198,201,32
,208,3,1374 LP
•190 DATA232,208,242,72,173,85,205,208,10
,192,0,240,1867 AM
•200 DATA6,104,201,48,176,238,72,104,153,
1,2,201,1306 FP
•210 DATA48,176,10,141,85,205,201,40,208,
3,141,83,1341 NE
•220 DATA205,232,200,208,204,153,1,2,165,
43,166,44,1623 DA
•230 DATA133,251,134,252,134,254,160,0,17
7,43,133,253,1924 BO
•240 DATA152,145,45,200,208,251,141,90,20
5,141,92,205,1875 EP
•250 DATA32,2,205,160,2,177,251,200,209,2
51,208,7,1704 HN
•260 DATA201,0,208,3,76,167,204,170,177,2
51,141,88,1686 HA
•270 DATA205,142,89,205,160,3,32,2,205,14
1,91,205,1480 IA
•280 DATA173,92,205,240,8,162,0,142,92,20

```

```

5,32,187,1538 AL
•290 DATA204,200,177,251,208,3,76,135,204
,201,131,240,2030 AL
•300 DATA4,201,143,208,3,76,138,204,201,3
4,208,7,1427 IK
•310 DATA174,91,205,240,212,208,207,174,9
1,205,208,208,2223 GE
•320 DATA201,65,144,22,201,91,176,200,141
,92,205,174,1712 PJ
•330 DATA84,205,208,55,174,87,205,224,2,1
44,51,76,1515 EP
•340 DATA237,203,174,92,205,240,190,201,5
8,176,173,201,2150 BG
•350 DATA48,176,228,201,32,240,178,201,36
,240,21,201,1802 EP
•360 DATA37,240,17,201,40,240,13,201,41,2
40,9,201,1480 BC
•370 DATA44,208,29,174,83,205,240,24,141,
84,205,174,1611 KC
•380 DATA87,205,157,93,205,238,87,205,201
,41,208,11,1738 BF
•390 DATA173,83,205,208,3,206,87,205,76,2
24,203,201,1874 CG
•400 DATA40,208,17,232,142,86,205,173,83,
205,208,8,1607 AP
•410 DATA169,0,141,92,205,141,87,205,76,2
37,203,32,1588 BA
•420 DATA187,204,32,5,205,166,253,165,254
,240,20,134,1865 DN
•430 DATA251,133,252,160,0,177,253,72,200
,177,253,133,2061 HI
•440 DATA254,104,133,253,76,191,203,173,9
0,205,208,7,1897 KL
•450 DATA169,47,160,205,32,30,171,169,0,1
41,0,2,1126 GP
•460 DATA76,116,164,162,0,189,0,2,240,18,
201,92,1260 GO
•470 DATA208,6,236,86,205,76,215,204,221,
93,205,208,1963 JJ
•480 DATA49,232,208,233,236,87,205,208,41
,104,104,173,1880 FI
•490 DATA90,205,208,7,169,21,160,205,32,3
0,171,169,1467 GK
•500 DATA76,160,205,32,30,171,173,88,205,
174,89,205,1608 LG
•510 DATA32,205,189,169,13,32,210,255,141
,90,205,76,1617 NJ
•520 DATA138,204,169,0,170,157,93,205,232
,208,250,141,1967 IE
•530 DATA84,205,141,86,205,141,87,205,96,
13,18,86,1367 DK
•540 DATA65,82,73,65,66,76,69,32,73,83,32
,73,789 IB
•550 DATA78,32,85,83,69,46,46,46,13,13,0,
13,524 JA

```

•560 DATA18,86,65,82,73,65,66,76,69,32,73,  
 ,83,788  
 •570 DATA32,78,79,84,32,73,78,32,85,83,69  
 ,46,771  
 •580 DATA46,46,13,0,76,73,78,69,58,32,0,2  
 20,711

MI  
 GN  
 CO

# C-128 VERSION

•10 REM \*\*\* VARI-SCAN 128 \*\*\* BUCK CHILDR  
 ESS \*\*\*  
 •20 REM \*\*\* P.O. BOX 13575 SALEM, OR 9730  
 9 \*\*\*  
 •30 PRINTCHR\$(147)"LOADING AND CHECKING D  
 ATA LINE:"J=4864  
 •40 FORB=0TO11:READA  
 •50 IFB=0THENL=PEEK(66)\*256+PEEK(65):PRIN  
 TCHR\$(19)TAB(31)L:PRINT  
 •60 IFA<0ORA>255THEN80  
 •70 POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA  
 =XTHEN90  
 •80 PRINT"ERROR IN DATA LINE:"L:END  
 •90 X=0:J=J+12:IFD<636THEN40  
 •100 PRINT"THE DATA IS OK[3"."]":PRINT  
 •110 PRINT"SYS 4864 TO ACTIVATE[3"."]":EN  
 D  
 •120 DATA104,104,32,129,146,79,78,0,169,2  
 9,162,19,1051  
 •130 DATA141,2,3,142,3,3,169,69,141,0,3,1  
 42,818  
 •140 DATA1,3,76,236,20,169,0,162,19,133,2  
 51,141,1211  
 •150 DATA0,255,134,252,169,251,141,185,2,  
 162,1,160,1712  
 •160 DATA0,177,251,32,119,255,230,251,208  
 ,238,230,252,2243  
 •170 DATA165,252,201,22,144,230,76,198,77  
 ,173,0,2,1540  
 •180 DATA201,95,208,22,32,129,146,79,70,7  
 0,0,169,1221  
 •190 DATA198,162,77,141,2,3,142,3,3,169,6  
 3,76,1039  
 •200 DATA20,19,201,65,144,4,201,91,144,3,  
 76,63,1031  
 •210 DATA77,32,250,81,162,0,160,0,140,120  
 ,21,140,1183  
 •220 DATA118,21,189,1,2,240,47,48,153,201  
 ,32,208,1260  
 •230 DATA3,232,208,242,72,173,120,21,208,  
 10,192,0,1481  
 •240 DATA240,6,104,201,48,176,238,72,104,  
 153,1,2,1345  
 •250 DATA201,48,176,10,141,120,21,201,40,  
 208,3,141,1310  
 •260 DATA118,21,232,200,208,204,153,1,2,1  
 65,45,166,1515  
 •270 DATA46,133,251,134,252,134,254,160,0  
 ,177,45,133,1719

ED  
 OA  
 AD  
 MB  
 LB  
 FK  
 PL  
 MG  
 OO  
 FB  
 AJ  
 ND  
 PI  
 AN  
 EJ  
 IN  
 IH  
 KK  
 GP  
 PL  
 KD  
 JG  
 DE  
 PP  
 HN  
 AF  
 IB

•280 DATA253,173,16,18,174,17,18,133,65,1  
 34,66,152,1219  
 •290 DATA145,65,200,208,251,141,125,21,14  
 1,127,21,32,1477  
 •300 DATA92,21,160,2,177,251,200,209,251,  
 208,7,201,1779  
 •310 DATA0,208,3,76,194,20,170,177,251,14  
 1,123,21,1384  
 •320 DATA142,124,21,160,3,32,92,21,141,12  
 6,21,173,1056  
 •330 DATA127,21,240,8,162,0,142,127,21,32  
 ,247,20,1147  
 •340 DATA200,177,251,208,3,76,162,20,201,  
 131,240,4,1673  
 •350 DATA201,143,208,3,76,165,20,201,34,2  
 08,7,174,1440  
 •360 DATA126,21,240,212,208,207,174,126,2  
 1,208,208,201,1952  
 •370 DATA65,144,22,201,91,176,200,141,127  
 ,21,174,119,1481  
 •380 DATA21,208,55,174,122,21,224,2,144,5  
 1,76,8,1106  
 •390 DATA20,174,127,21,240,190,201,58,176  
 ,173,201,48,1629  
 •400 DATA176,228,201,32,240,178,201,36,24  
 0,21,201,37,1791  
 •410 DATA240,17,201,40,240,13,201,41,240,  
 9,201,44,1487  
 •420 DATA208,29,174,118,21,240,24,141,119  
 ,21,174,122,1391  
 •430 DATA21,157,128,21,238,122,21,201,41,  
 208,11,173,1342  
 •440 DATA118,21,208,3,206,122,21,76,251,1  
 9,201,40,1286  
 •450 DATA208,17,232,142,121,21,173,118,21  
 ,208,8,169,1438  
 •460 DATA0,141,127,21,141,122,21,76,8,20,  
 32,247,956  
 •470 DATA20,32,95,21,166,253,165,254,240,  
 20,134,251,1651  
 •480 DATA133,252,160,0,177,253,72,200,177  
 ,253,133,254,2064  
 •490 DATA104,133,253,76,218,19,173,125,21  
 ,208,37,169,1536  
 •500 DATA0,141,0,255,32,129,146,13,18,86,  
 65,82,967  
 •510 DATA73,65,66,76,69,32,73,83,32,78,79  
 ,84,810  
 •520 DATA32,73,78,32,85,83,69,46,46,46,13  
 ,0,603  
 •530 DATA169,0,141,0,2,141,0,255,76,55,77  
 ,162,1078  
 •540 DATA0,189,0,2,240,18,201,92,208,6,23  
 6,121,1313  
 •550 DATA21,76,19,21,221,128,21,208,79,23  
 2,208,233,1467  
 •560 DATA236,122,21,208,71,104,104,169,0,  
 141,0,255,1431

GO  
 HB  
 AO  
 CK  
 HJ  
 JP  
 JC  
 DJ  
 GL  
 HH  
 JO  
 HB  
 EI  
 MN  
 FJ  
 HP  
 CJ  
 JM  
 JF  
 AA  
 EG  
 JF  
 OI  
 FJ  
 AN  
 FJ  
 DK  
 HL  
 FM

```

•570 DATA173,125,21,208,29,32,129,146,13,18,86,65,1045 HO
•580 DATA82,73,65,66,76,69,32,73,83,32,73,78,802 JJ
•590 DATA32,85,83,69,46,46,46,13,13,0,32,129,594 KF
•600 DATA146,76,73,78,69,58,32,0,173,123,21,174,1023 MO
•610 DATA124,21,32,50,142,169,13,32,210,255,141,125,1314 KM
•620 DATA21,76,165,20,169,0,170,157,128,21,232,208,1367 IN
•630 DATA250,141,119,21,141,121,21,141,122,21,169,63,1330 KJ
•640 DATA141,0,255,169,0,96,0,0,65,72,83,0,881 HC

```

## THERMAL CONNECTION FROM PAGE 32

### C-64 PADDLE ROUTINE

```

1 REM=====
3 REM      C-64 PADDLE ROUTINE
4 REM      RUPERT REPORT #55
5 REM
6 REM      MONITOR LISTING
8 REM=====
9 REM DISABLE INTERRUPTS (LINE 90)
10 REM SAVE CIA DDR (LINE 100)
11 REM SET BITS 7 & 6 OF CIA
12 REM #1 AS OUTPUTS (110-120)
13 REM ENABLE POTS A AND B (130)
14 REM PUT DELAY COUNT IN X (140)
15 REM DELAY LOOP (150-170)
16 REM READ POT X (180)
17 REM STORE POT X IN 251 (190)
18 REM READ POT Y (200)
19 REM STORE POT Y IN 252 (210)
20 REM RESTORE CIA DDR (220)
21 REM ENABLE INTERRUPTS (230)
22 REM BACK TO BASIC (240)
23 REM=====
90 "OC000 78 SEI
100 "OC001 AC 02 DC LDY $DC02
110 "OC004 A9 C0 LDA #$C0
120 "OC006 8D 02 DC STA $DC02
130 "OC009 8D 00 DC STA $DC00
140 "OC00C AA TAX
150 "OC00D EA NOP
160 "OC00E CA DEX
170 "OC00F 10 FC BPL $C00D
180 "OC011 AD 19 D4 LDA $D419
190 "OC014 85 FB STA $FB
200 "OC016 AD 1A D4 LDA $D41A
210 "OC019 85 FC STA $FC

```

```

220 "OC01B 8C 02 DC STY $DC02
230 "OC01E 58 CLI
240 "OC01F 60 RTS

```

### THERMAL CONNECTION

```

•1 REM ===== AO
•2 REM JD
•3 REM      THERMAL CONNECTION FF
•4 REM JF
•5 REM      RUPERT REPORT #55 CE
•6 REM JH
•7 REM ===== NE
•8 REM CALIBRATE AND READ THERMISTOR FH
•9 REM CONNECTED TO PADDLE INPUT PL
•10 REM ===== JL
•20 DEF FNR(X)=INT(10*X+.5)/10 :REM
    ROUND OFF TO 1 DECIMAL JO
•30 DEF FNK2F(T)=1.8*(T-273)+32 :REM
    CONVERT DEG K TO DEG F JP
•40 DEF FNF2K(T)=273+(T-32)/1.8 :REM
    CONVERT DEG F TO DEG K AE
•50 DEF FNT(R)=1/(1/T0+(1/B)*LOG(R/R0)) :
    REM TEMP IN DEG K BJ
•60 GOSUB 3000 :REM GET CALIBRATION
    CONSTANTS NG
•70 PRINT "PUT THERMISTOR AT NEW TEMPERAT
    URE" GF
•80 PRINT "PRESS ANY KEY WHEN READY" KP
•90 GET K$: IF K$="" THEN 90 JA
•95 REM ----- MAIN LOOP ----- FH
•100 R=POT(1) LN
•110 T=FNT(R) :REM TEMP IN DEG K MM
•120 PRINT "TEMPERATURE :";FNR(FNK2F(T));
    "DEG F "; HA
•130 PRINT FNR(T-273); "DEG C" OO
•140 GOTO 100 KB
•1000 REM ---- WAIT FOR SETTLING ----- KF
•1010 PRINT "PRESS A KEY WHEN VALUE HAS S
    ETTLED :"; EC
•1020 P1=POT(1) JB
•1030 PRINT P1; FO
•1040 GET K$: IF K$="" THEN 1020 MB
•1050 RETURN KM
•2000 REM ---- AVERAGE VALUES ----- JE
•2010 SUM=0 LM
•2020 FOR N=1 TO 10 JL
•2030 P1=POT(1) HD
•2040 SUM=SUM+P1: NEXT HL
•2050 RN=SUM/10 FH
•2060 RETURN KC
•3000 REM ---- GET CALIB. CONSTANTS ----- EM
•3010 PRINT "[CLEAR]DO YOU KNOW CALIBRATI
    ON CONSTANTS (Y/N)": INPUT K$ CJ
•3020 IF K$="N" THEN 3070 :REM CALIBRATE MH
•3030 INPUT "WHAT IS B"; B JN

```

TION

AO

JD

FF

JF

CE

JH

NE

FH

PL

JL

M

JO

M

JP

M

AE

:

BJ

N

NG

T

GF

KP

JA

FH

LN

MM

HA

OO

KB

KF

EC

JB

FO

MB

KM

JE

LM

JL

HD

HL

FH

KC

EM

CJ

MH

JN

```

3040 INPUT "WHAT IS T0"; T0
3050 INPUT "WHAT IS R0"; R0
3060 GOTO 3270 :REM RETURN
3070 PRINT "PUT THERMISTOR AT ROOM TEMP"
3080 INPUT "WHAT IS ROOM TEMP (DEG F)"; T1
3090 GOSUB 1010 :REM DISPLAY RESISTANCE
3100 GOSUB 2010 :REM RETURN VALUE
3110 R1=RN
3120 PRINT: PRINT "PUT THERMISTOR IN ICE
      WATER"
3130 PRINT "PRESS ANY KEY WHEN READY"
3140 GET K$: IF K$="" THEN 3140
3150 GOSUB 1010
3160 GOSUB 2010
3170 R0=RN
3180 T1=FN F2K(T1): T0=273
3190 PRINT: PRINT "[38"="]"
3200 B=LOG(R1/R0)/(1/T1-1/T0)
3210 PRINT "RECORD THESE CALIBRATION CON
      STANTS : "
3220 PRINT "B ="; FNR(B)
3230 PRINT "T0 ="; T0
3240 PRINT "R0 ="; R0
3250 PRINT "[38"="]"
3260 PRINT "THERMISTOR IS NOW CALIBRATED
      ": PRINT: PRINT
3270 RETURN
4990 REM #####
4991 REM FOLLOWING LINES FOR C-64 ONLY
4992 REM #####
4993 REM ADD LINE 11
4994 REM REPLACE LINES 100, 1020, 2030
4995 REM ADD LINES 5010-49184
4996 REM
5000 REM 11 SA=49152: GOSUB 5010
5001 REM 100 SYS SA: R=PEEK(251)
5002 REM 1020 SYS SA: P1=PEEK(251)
5003 REM 2030 SYS SA: P1=PEEK(251)
5004 REM =====
5010 M=49152: CSUM=4609
5020 READ B$: IF B$="XX" THEN 5100
5030 B=VAL(B$)
5040 POKE M,B: M=M+1: CK=CK+B
5050 GOTO 5020
5100 IF CK=CSUM THEN RETURN
5110 PRINT "DATA ERROR. CHECK TYPING.":
      END
49152 DATA 120,172,2,220,169,192,141,2
49160 DATA 220,141,0,220,170,234,202,16
49168 DATA 252,173,25,212,133,251,173,26
49176 DATA 212,133,252,140,2,220,88,96
49184 DATA XX

```

CM  
AO  
NP  
IK  
NC  
EM  
LO  
AN  
CI  
JF  
OG  
KJ  
LC  
EK  
FF  
EP  
DH  
KH  
OG  
DP  
DN  
ML  
AA  
GA  
HO  
NE  
FM  
JA  
LK  
GB  
CE  
ME  
FM  
MD  
DG  
JC  
IE  
NO  
CM  
EE  
BJ  
EN  
OI  
KB  
LB  
MN  
NP  
BE

```

TCHR$(11)CHR$(142)CHR$(147):CHAR,10,5,"[
c 5][s U][4"[s C]"]][s I][DOWN][6"[LEFT]"
][s B][4"Z"]][s B][DOWN][6"[LEFT]"]][s J][
4"[s C]"]][s K][s Q][DOWN][s W][DOWN][s W
][DOWN].[DOWN]. "
NP
20 CHAR,20,12,"[c 8][4"[c @]"]][DOWN][5"[
LEFT]"]][s N][s F][s F][s F][s M][DOWN][
7"[LEFT]"]][s N][4"[c +]"]][c +][s M][DOW
N][8"[LEFT]"]][8"[c U]"]]:CHAR,23,10,"(WO
RKING)"
BK
30 FORX=3584TO4096:READA$:POKEX,DEC(A$):
NEXT:FORX=4864TO5054:READA$:POKEX,DEC(A$
):NEXT
JE
40 FORX=.TO63:POKE55*64+X,..:NEXT:POKE55*
64+32,192:POKE55*64+35,192:PRINTCHR$(147
)
HE
50 POKE4593,203:POKE4592,100:POKE4595,0:
POKE4594,30:POKE4602,250:POKE4597,0:POKE
4598,130:POKE4599,56:SYS4864
EO
60 B$="":FORX=.TO39:B$=B$+CHR$(32):NEXT:
FORX=1TO8:MOVSPRX,..:NEXT
EA
70 TEMPO10:D$(.)="01":D$(2)="02":D$(3)="
03":D$(4)="04":D$(5)="04":D$(6)="01"
MJ
80 FORX=4TO7:POKE2040+X,62:NEXT:FORX=5TO
6:SPRITE,..,13,..,1,1,..:NEXT:FORX=7TO8:SP
RITE,..,12,..,1,..:NEXT:POKE2040+3,63:PO
KE2041,55:SPRITE2,..,2,..,.,.,.
PI
90 MOVSPR5,30,152:MOVSPR6,250,152:MOVSPR
7,120,157:MOVSPR8,350,157:FORX=5TO6:MOVS
PRX,270#2:MOVSPRX+2,270#1:NEXT:POKE2040,
56:SPRITE1,..,14,..,.,.,.:MOVSPR1,100,198
EI
100 POKE2043,60:POKE2042,59:SPRITE3,..,4,
,..,.,1:MOVSPR3,370,150:SPRITE4,..,13,..,1
,1,..:MOVSPR4,370,198:MOVSPR4,270#3
BC
110 GOSUB380:PRINTCHR$(27)"M";"[4"[DOWN]
"]][RVSON][c 4]"B$B$"[c 5]"B$B$B$"[c 8]"B
$B$B$B$
CH
120 DIMD(8),S(1),M$(2)
MN
130 J=.:D=.:G=15:F=127:Z=.:V=1:Q=.:S=.:B
=.:H=5:P=10:I=5:K=25:U=1:T=2:M=3:L=198:S
C=.:N=4:Q=240:VIC=53248:S(.)=315:S(1)=22
5
AA
140 A$="[HOME][5"[DOWN]"]][21"[RIGHT]"]":
B$="[8"[RIGHT]"]":M$(.)=" YOU RECOVERED
THE BUGGY! ":M$(1)=" YOU CRASHED IN A CR
ATER! ":M$(2)=" YOU COLLIDED WITH THE SH
IP!"
AN
150 FORX=1TO10:READB$(X):NEXT
AA
160 FORX=.TO8:D(X)=-1:NEXT:D(.)=90:D(1)=
0:D(3)=90:F$="[5"#""]":H$="[4"#""]":SPRCOL
OR7,3
BE
170 DEFFNJ(X)=(C<H)*T+(C=>H)*-T+(C=P)*T
KA
180 DEFFNF(U)=-((J>FANDD(X)=>.ANDRSPRITE(
T,..)=.):DEFFNC(X)=(J=H)*-U+((JANDG)=H+U)
*-T+((JAND(H+M))>.)*-M
IE
190 POKEVIC+21,241:X=.:DO:PLAYD$(X):PLAY
"7IG#GGEG#GGE":X=X+1+(X=6)*7:LOOPWHILEJ
OY(2)<127:WINDOW0,0,39,15,1:PRINT"[HOME]

```

## LUNAR BUGGY

### FROM PAGE 15

```

10 POKE53248+21,..:COLOR0,1:COLOR4,1:PRIN

```

```

[HOME]:FORJ=.TO99:X=RND(U)*585:POKE1024
+X,46
.200 POKE55296+X,RND(U)*P+U:NEXT
.210 CHAR,1,5,"[GREEN]MILES TO NEXT BASE:
[c 6][5"0"] [GREEN]SCORE [c 6][5"0"]"
.220 GOSUB360:B=500:Q=(10-V)*.1:CHAR,15,2
,"[c 7]BASE [WHITE]":PUDEF" ":PRINTUSING
H$:B$(V):PUDEF"0":MOVSPR3,480,160:SPRITE
3,1,V+1:POKE4595,1
.230 J=BUMP(U):J=BUMP(U)
.240 REM MAIN LOOP
.250 DO:J=JOY(T):X=JOY(T)ANDG:IFDTHENMOVS
PRU,+,+,D:C=C+U:D=FNJ(.):ELSEMOVSPRU,+,+,
L:IFX=UANDJ<FTHEND=-U:C=.:SOUNDU,F*F,K,.,
F*M,F*M,.:ELSEIFRND(.)>QTHENZ=-(Z=.)
.260 ONFN(. )GOSUB350:MOVSPRM,S(Z)#V:PRIN
TA$,:PRINTUSINGF$:B$:B=B-U:PRINTB$,:PRIN
TUSINGF$:S:J=BUMP(U):LOOPUNTILB<.ORFNC(.
):ONFNC(. )GOTO300,340,310
.270 MOVSPRU,+,+,L:V=V+U:D=.:IFV<11THEN220
.280 FORX=1TO8:MOVSPRX,.,#.:NEXT:PLAY"V101
Q$BV202I$BV105.W$BV203I$B04I$EV303IGI$BV
204IGIGV3I$EO3I$BV2IFI$EV303IGI$BV204IFQ
GV3Q$EO3Q$BV204Q$EQ$EV303QG":X=.:
.290 J=1:DO:PRINT"[HOME][7"DOWN"]"[RVSON
]"TAB(6)M$(X):COLOR5,J:J=J+1+(J=16)*16:L
OOPUNTILJOY(T)>127:RUN
.300 GOSUB320:X=2:GOTO290
.310 GOSUB320:X=1:GOTO290
.320 SYS65418:FORX=1TO8:MOVSPRX,.,#.:NEXT:
FORX=1TO3:SPRITEX,.,2,.,.,.,.,.:MOVSPRX,RS
PPOS(U,.),RSPPOS(U,U):POKE2039+X,61:NEXT
.330 SOUND3,4000,120,1,500,500,3:FORX=1TO
3:MOVSPRX,X*45+20#2:SPRITEX,U:NEXT:SLEEP
2:POKEVIC+21,248:RETURN
.340 POKE2042,61:MOVSPRM,.,#.:SOUNDM,F*P,K
*M,T,K*M,K*M,M:SPRITEM,.:MOVSPRM,480,+,.:
POKE2042,59:SPRITEM,U:S=S+100*V:GOTO230
.350 SPRITET,.:MOVSPRT,.,#.:MOVSPRT,RSPPOS
(U,.),RSPPOS(U,U):MOVSPRT,D(X)#P:SOUNDT,
F*K,K,U,F,F,M:SPRITET,U:RETURN
.360 SPRITE3,.:SPRITE4,.,2,.,1,1,1:MOVSPR
4,470,176:POKE2043,63:SPRITE4,1:DO:X=RSP
POS(4,.):LOOPUNTILX>470ANDX<480
.370 SPRITE4,.,13,.,1,1,.:MOVSPR4,480,198
:POKE2043,60:SPRITE4,1:RETURN
.380 PRINT"[HOME]"TAB(7)"[YELLOW]AHOY! MA
GAZINE PRESENTS[DOWN]"
.390 PRINTTAB(8)"[GREEN][RVSON] [RVSOFF]
[RVSON] [c J] [c G] [c *] [c G][3" "
][c G][3" ""]
.400 PRINTTAB(8)"[RVSON] [RVSOFF] [RVSON]
[c J] [c G][4" "][c G][c C][c V] [c
G][c C][c V] "
.410 PRINTTAB(8)"[RVSON] [RVSOFF] [RVSON]
[c J] [c G] [RVSOFF][c *][RVSON] [c
G] [c G] [c G] [RVSOFF][c *][RVSON] [c
*]"

```

HA  
HB  
ON  
KB  
BL  
NG  
BB  
CP  
IJ  
OF  
FC  
AB  
BC  
JE  
CF  
FN  
BG  
MA  
EG  
PH  
JE  
KK  
FH

```

.420 PRINTTAB(8)"[RVSON][3" "][c M][4" "
[c G] [RVSOFF] [RVSON] [c G] [c G] [c G
] [RVSOFF] [RVSON] "
.430 PRINTTAB(8)"[c 6][RVSON] B[3" "U[3
" "G[3" "G[3" "Y! "
.440 PRINTTAB(12)"[YELLOW][DOWN][DOWN]FOR
THE C-128!":PRINTTAB(4)"[DOWN][c 6](C)1
988 CLEVELAND M. BLAKEMORE":RETURN
.450 REM SPRITE DATA
.460 DATA 0F,80,,10,47,,23,22,,2E,22,,7F,
FF,80,FF,FF,E0,FF,1,F0,FE,BA,F8,54,BA,55
,FF,1,FF,FF,B9,FD,7F,76
.470 DATA FC,3E,E7,78,1,DB,80,3,81,C0,7D,
,BE,D6,,6B,92,,49,92,,49,D6,,6B,7C,,3E,,
F,80,,10,47,0
.480 DATA 23,22,,2E,22,,7F,FF,80,FF,FF,E0
,FF,1,F0,FE,BA,F8,54,BA,55,FF,1,FF,FF,B9
,FD,7F,76,FC,3E,E7,78,1,DB
.490 DATA 80,3,81,C0,7D,,BE,C6,,63,9A,,4D
,B2,,59,C6,,63,7C,,3E,,F,80,,10,47,,23,2
2,,2E,22,0
.500 DATA 7F,FF,80,FF,FF,E0,FF,1,F0,FE,BA
,F8,54,BA,55,FF,1,FF,FF,B9,FD,7F,76,FC,3
E,E7,78,1,DB,80,3,81,C0,7D,0
.510 DATA BE,C6,,63,B2,,59,9A,,4D,C6,,63,
7C,,3E,,AA,,2,14,80,2,14,80,2A,AA,A8,99
,96,66,AA,AA,AA
.520 DATA 2A,AA,A8,,FF,,,,,,,,,,,,,,,,,
,,,,,,,,,0
.530 DATA0,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,,0
.540 DATA0,,,,,,FF,FF,FF,7F,FF,FE,7F,FF,F
8,FF,FF,FC,6F,FF,FE,F,FF,F0,F,FF,30,C,FF
,90,,73,80,,20
.550 DATA0,,,,,,24,40,9,,,,,24,48,2,1,1,20
,,20,8,10,2,80,4A,88,11,38,1,,7D,8,42,90
,0
.560 DATA0,28,82,90,82,,10,8,20,44,1,8,,
28,,81,,24,,10,,24,40,1,,,,,4,,,,,0
.570 DATA0,,,,,,,,,,,,,40,,,,,42,,,,,C3,,1,C3,
,1,C3,,1,E3,80,3,E7,80,7,FF,80
.580 DATA 07,FF,C0,7,FF,E0,7,FF,F0,7,FF,F
0,F,FF,F0,F,FF,F8,3F,FF,FC,7F,FF,FC,FF,F
F,FF,,5,FC,,5,A8,0
.590 DATA 0F,FC,,A,A8,,F,FC,,8,,8,,8,,5
,55,50,15,55,54,55,55,55,66,69,99,55,55,
55,66,69,99
.600 DATA 55,55,55,55,55,55,56,96,95,56,9
6,95,56,96,95,56,96,95,56,96,95,,7
.610 REM INTERRUPT DATA
.620 DATA 78,A9,D,8D,14,3,A9,13,8D,15,3,5
8,60,AD,F3,11,D0,3,4C,2F,13,AD,,DC,29,F,
85,FD,A9,F,38,E5,FD,C9,4
.630 DATA D0,3,CE,D6,11,C9,8,D0,3,EE,D6,1
1,AD,D6,11,38,CD,F2,11,B0,9,AD,F2,11,8D,
D6,11,4C,50,13,AD,D6,11,38,CD
.640 DATA FA,11,90,6,AD,FA,11,8D,D6,11,A2
,7,8E,F4,11,AD,F4,11,A,AA,E8,BD,D6,11,38

```

OJ  
OA  
CP  
CG  
KI  
FE  
CK  
OB  
KD  
HH  
GK  
AJ  
NE  
EB  
LM  
DH  
CC  
GJ  
KE  
NO  
GA  
AN

,CD,F0,11,B0,15,AD,F0,11,9D,D6  
 •650 DATA 11,E0,3,D0,1A,A9,FD,2D,15,D0,8D  
 ,15,D0,4C,88,13,BD,D6,11,38,CD,F1,11,90,  
 6,AD,F1,11,9D,D6,11,CE,F4,11,30  
 •660 DATA 3,4C,55,13,CE,F5,11,30,16,AD,F6  
 ,11,8D,F5,11,AE,F7,11,E8,E0,3B,D0,2,A2,3  
 8,8E,F7,11,8E,F8,7,AD,D8,11,38  
 •670 DATA CD,FA,11,90,8,A9,FD,2D,15,D0,8D  
 ,15,D0,4C,65,FA  
 •680 REM BASES  
 •690 DATA I,II,III,IV,V,VI,VII,VIII,IX,X

ID •440 DATA -144,104,240,16,96,104,173,-21 BM  
 •450 DATA 208,249,76,40,125,201,5,144 AI  
 •460 DATA 48,176,242,173,-22,133,236,173 MI  
 DF •470 DATA 23,19,133,235,76,92,193,32 DD  
 •480 DATA 134,3,240,222,32,92,121,76 HD  
 •490 DATA 90,85,32,-170,164,230,200,232 IP  
 HC •500 DATA 32,-171,200,196,231,208,248,232 NP  
 •510 DATA 189,-12,76,12,192,134,195,168 EM  
 GM •520 DATA 169,246,162,19,24,121,-24,144 IE  
 LN •530 DATA 1,232,164,195,133,195,134,196 CF  
 IO •540 DATA 162,26,152,208,22,160,37,136 HJ  
 •550 DATA 181,224,145,195,202,16,248,162 GB  
 •560 DATA 13,136,189,84,3,145,195,202 LM  
 •570 DATA 16,247,96,160,37,136,177,195 LL  
 •580 DATA 149,224,202,16,248,162,13,136 CN  
 •590 DATA 177,195,157,84,3,202,16,247 DM  
 •600 DATA 96,0,999 HB

## WINDOW DRESSING FROM PAGE 37

### BASIC LOADER

•100 REM \*\*\* WINDOW DRESSING LOADER \*\*\* NC  
 •110 SA=4864:REM WILL RELOCATE LA  
 •120 CK=0 OL  
 •130 READD:CK=CK+D:IFD=999THEN150 AG  
 •140 GOTO130 KO  
 •150 IFCK<>30632THENPRINT"ERROR IN DATA":  
 END IC  
 •160 RESTORE CM  
 •170 NA=SA IP  
 •180 READD:IFD=999THEN230 AL  
 •190 IFD=>0THENPOKENA,D:GOTO220 LP  
 •200 AD=SA+ABS(D):H=AD/256:L=AD-INT(AD/25  
 6)\*256 BB  
 •210 POKENA,L:NA=NA+1:POKENA,H BO  
 •220 NA=NA+1:GOTO180 OA  
 •230 AD=SA+246:H=AD/256:L=AD-INT(AD/256)\*  
 256 LE  
 •240 POKESA+181,L:POKESA+183,H NF  
 •250 PRINT"WINDOW DRESSING INSTALLED"SA"TA  
 0"NA CN  
 •260 PRINT"SYS"SA"FOR FRAME" CG  
 •270 PRINT"SYS"SA+3"FOR PRINT AT" EO  
 •280 PRINT"SYS"SA+6"FOR CRSR RESTORE" HJ  
 •290 PRINT"SYS"SA+9"FOR EDITOR SAVE/RECAL  
 L" GF  
 •300 END KN  
 •310 DATA 184,80,26,184,80,86,184,80 MI  
 •320 DATA 122,184,80,113,176,192,174,221 MF  
 •330 DATA 29,221,173,192,189,0,0,0 FP  
 •340 DATA 0,40,80,120,160,32,80,193 IA  
 •350 DATA 165,248,133,207,32,229,202,162 OE  
 •360 DATA 255,32,-155,164,229,200,132,206 MC  
 •370 DATA 32,-155,230,206,164,206,196,228 JI  
 •380 DATA 240,5,202,202,202,208,240,32 MM  
 •390 DATA -155,32,84,200,32,-144,165,207 JA  
 •400 DATA 133,248,230,229,230,230,198,228 JC  
 •410 DATA 198,231,32,50,202,76,111,199 NH  
 •420 DATA 72,165,236,141,-22,165,235,141 FM  
 •430 DATA -23,24,32,24,192,176,7,32 MP

### DEMO

•100 REM WINDOW DRESSING DEMO GA  
 •110 GOSUB510 JG  
 •120 COLORBG,15:COLOR4,15 FA  
 •130 COLOR5,8:WINDOW0,0,SW-1,4:SYS FR,,,,  
 ,M\$;1:SLEEP1:PRINT"[DOWN][RIGHT]AS YOU C  
 AN SEE[3"."]" OO  
 •140 SLEEP1:PRINTEQ\$"[RIGHT]THESE ROUTINE  
 S[3"."]":SLEEP1:SYS ED,0,0 PC  
 •150 COLOR5,14:WINDOW0,5,SW/2-1,24:SYS FR  
 ,,,,,M\$;2:SYS ED,1,0 KN  
 •160 SYS ED,0,1:PRINTEQ\$"[RIGHT]DRESS UP  
 YOUR WINDOWS,"SLEEP1 HG  
 •170 COLOR5,2:WINDOWSW/2,5,SW-1,24:SYS FR  
 ,,,,,M\$;3:SYS ED,2,0 FO  
 •180 SYS ED,0,1 JD  
 •190 PRINTEQ\$"[RIGHT]LET YOUR PROGRAMS[3"  
 ."]":SLEEP1 DO  
 •200 PRINTEQ\$"[RIGHT]JUMP FROM WINDOW[3"  
 ."]":SLEEP1 HI  
 •210 SYS ED,1,1:LIST:SYS ED,1,0:SLEEP1 MG  
 •220 SYS ED,0,1:PRINTEQ\$"[RIGHT]TO WINDOW  
 [3"."]":SLEEP1 DA  
 •230 SYS ED,2,1:LIST:SLEEP2 DG  
 •240 SYS ED,0,1:PRINTEQ\$"[RIGHT]PRINT ANY  
 WHERE[3"."]":SLEEP1 PB  
 •250 SYS ED,1,1:PRINT"[DOWN][RVSON]HERE,"  
 ;:SLEEP1:SYS AT,0,12,0,,EQ\$"HERE,"; FC  
 •260 SLEEP1:PRINT" OR HERE,"SLEEP1 NO  
 •270 SYS ED,0,1:PRINTEQ\$"[RIGHT]AND RETUR  
 N." NM  
 •280 SLEEP3 EO  
 •290 PRINT"[RVSON]";:COLOR5,2 PB  
 •300 WINDOW4,2,24,20,1:SYS FR,,,,,"[3"[RI  
 GHT]]MENU" OF  
 •310 PRINT:PRINT"[RIGHT]1. RESTART":PRINT  
 "[RIGHT]2. THE SHADOW" DJ

```

.320 PRINT"[RIGHT]3. THE TUNNEL":PRINT"[R
IGHT]4. QUIT"
.330 PRINT:PRINT:PRINT"[RIGHT]YOUR CHOICE
?";
.340 SYS 52591:REM CRSR ON
.350 GETKEY K$:IF K$<"1" ORK$>"4"THENPRIN
T"[3"[UP]"]":GOTO330
.360 SYS 52639,32:REM CRSR OFF
.370 PRINTK$
.380 K=VAL(K$):ONK GOTO110,410,480
.390 SLOW:END
.400 REM SIMULATE A "FLOATING" WINDOW WIT
H SHADOW
.410 WINDOW7,8,SW-9,14:PRINT"[BLACK][RVSO
N]";:AL=PEEK(FA):AH=PEEK(FA+1)
.420 POKEFA,0:POKEFA+1,11:REM POINT TO SP
ACE CHARACTERS
.430 SYS FR:WINDOW8,7,SW-8,13
.440 COLOR5,8:PRINT"[RVSON]";:SYS FR
.450 POKE FA,AL:POKE FA+1,AH:REM DEFAULT
FRAME
.460 SLEEP3:GOTO280
.470 REM TUNNEL
.480 COLOR5,14
.490 FORI=0TO7:SYS FR:NEXT
.500 GOTO280
.510 BG=0:SW=RWINDOW(2)
.520 SA=4864:FR=SA:AT=SA+3:CR=SA+6:ED=SA+
9:FA=SA+172
.530 M$="[RIGHT][RVSON]WINDOW":B1$="[9" "
]"
.540 FORI=0TO8:POKE2816+I,ASC(MID$(B1$,I+
1,1))
.550 NEXT
.560 IFSW=8THENBG=6:FAST
.570 EQ$="[UP]"+CHR$(27)+"Q"
.580 RETURN

```

## GUERRILLA FROM PAGE 16

```

.10 POKE53281,,:POKE53280,,:PRINTCHR$(8)C
HR$(142)"[CLEAR][7"[DOWN]"]"TAB(15)"[PUR
PLE]GUERRILLA"
.20 PRINTTAB(8)"[CYAN][DOWN][DOWN](C)1988
CLEVE BLAKEMORE"
.30 DIM T(7),B(7),E$(4),D$(103),I$(7)
.40 V=53248:SP=2040:J=56320:S=54272
.45 M=90:I=1:N=16:C=.:G=30:U=1:L=7:P=5318
0:AM=.:BM=4:TH=.:LM=50
.50 K=21:B=255:W=13:Q=V+39:R=2:E=5:XC=37:
YC=19:H=3:XS=7:YS=24:Z=150:LV=1:DM=103
.60 FORX=2TO15:READA:POKEV+X,A:NEXT:FORX=
.T0127:READA:POKE832+X,A:NEXT
.70 FORX=.T063:POKE11*64+X,,:POKE15*64+X,

```

```

.:NEXT
.80 FORX=.T012STEP3:POKE11*64+29+X,24:NEX
T
.90 POKE11*64+35,255:POKESP,11:POKEV,156:
POKEV+1,188:POKEV+39,1
.100 FORX=53000TO53223:READA:POKEX,A:NEXT
.110 FORX=UTOL:B(X)=2[UPARROW]X:NEXT
.120 A$="[RVSON][c Y][s P][RVSOFF][sEP][U
P][3"[LEFT]"]][RVSON][sEP][s C][s N][DOWN
]":E$(.)="[UP][DOWN][DOWN][LEFT]":E$(
1)="[DOWN]":E$(2)="[DOWN]"
.130 E$(3)="[UP][LEFT]":E$(4)="[UP][
DOWN]":BL$="[RVSON][RED]"
.140 B$="[c 4][RVSON]":FORX=.T019:B$=B$+"
[s 0][s P]":BL$=BL$+CHR$(32):NEXT:C$=RIG
HT$(B$,39)+"[s 0]"
.150 I$(.)="[RVSOFF]":I$(1)="[RVSOFF][c
G]":I$(2)="[RVSOFF][c H]":I$(3)="[RVSOFF
][c J]":I$(4)="[RVSOFF][c K]":I$(5)="[RV
SON][c L]"
.160 I$(5)="[RVSON][c N]":I$(6)="[RVSON][
c M]":I$(7)="[RVSON]":V$="ENEMY DECIMAT
ED[3"."]FORTRESS SAVED!!"
.170 FORX=.T039:D$=D$+"[s I]":E$=E$+"[s K
]":NEXT
.180 FORX=.T016:FORA=.T07:D$(X*6+A)=LEFT$
(BL$,X+2)+I$(A)+"[RVSOFF]":NEXT:NEXT
.190 POKEV+16,64+128:FORX=1TO7:POKESP+X,1
3:POKEV+39+X,5:NEXT
.200 GOSUB480:GOSUB450:GOSUB460:X=FRE(.)
.210 FORX=.T0103:SYSP,9,23:PRINTD$(X):NEX
T
.220 X=1:POKEV+K,U:C=PEEK(V+G):C=PEEK(V+G
):SYSP53000
.230 REM MAIN LOOP
.240 F=PEEK(J)ANDN:X=X+U+(X=L)*L:IFT(X)TH
ENT(X)=T(X)-U:IFT(X)=.THENGOSUB290
.250 C=RND(U)*M+U:IFC<L+UTHEIFT(C)=.THEN
T(C)=G-INT(I):POKEV+K,PEEK(V+K)ORB(C)
.260 C=PEEK(V+G):ON-(F>.)GOTO240:GOSUB390
:AM=AM+U
.265 IFAM=LMTHENAM=.:BM=BM-U:SYSP,27+H*BM
,YS:PRINT"[BLACK]"A$;:ON-(BM=.)GOTO320
.270 ON-(C=.)GOTO240:FORA=UTOL:IF(CANDB(A
))THENGOSUB340
.280 NEXT:C=PEEK(V+G):C=PEEK(V+G):GOTO240
.290 SYSP,RND(U)*XC,RND(U)*H+YC:PRINTE$(R
ND(U)*E);:POKEQ+X,W:GOSUB400:GOSUB390
.300 DM=DM-U:SYSP,9,23:PRINTD$(DM)"":FOR
A=.TON:POKEV+G+H,A:NEXT:A=X:IFDMGOTO380
.310 POKES+18,129:FORX=.T0400:POKES+15,RN
D(.)*Z:POKEV+33,XANDG:NEXT:GOSUB450
.320 POKEV+21,,:PRINT"[CLEAR][5"[DOWN]"]"
:PRINTTAB(4)"[c 3]OUR FORTRESS HAS BEEN
DESTROYED !!"
.330 PRINTTAB(12)"[c 5][3"[DOWN]"]FINAL S

```

CORE:[WHITE]"SC:FORX=.TO7000:NEXT:RUN  
 340 POKESP+A,W+U:POKEQ+A,R:SC=SC+Z\*LV:SY  
 SP,XS,YS:PRINT"[WHITE][RVSOFF]"SC;:M=M+(  
 M>L)  
 350 IFI<26THENI=I+.5  
 360 IFI=10ORI=18ORI=25THENLV=LV+U:POKE20  
 05,48+LV:GOSUB420  
 370 TH=TH+U:IFTH=ZTHENPOKEV+21,..:PRINT"  
 CLEAR][6"[DOWN]""]TAB(11)V\$:GOSUB420:GOT  
 0330  
 380 GOSUB410:POKEV+K,PEEK(V+K)AND(B-B(A)  
 ):POKESP+A,W:POKEQ+A,E:T(A)=.:RETURN  
 390 POKES+8,4:POKES+11,129:FORA=.TO50:NE  
 XT:POKES+11,128:RETURN  
 400 POKES+18,129:FORA=ZTO.STEP-E:POKES+1  
 5,A:NEXT:POKES+18,128:RETURN  
 410 FORD=.TOZ:NEXT:RETURN  
 420 M\$="251331421502421502":GOSUB450:POK  
 ES+6,96:FORLL=1TO18STEP3  
 430 POKES+1,VAL(MID\$(M\$,LL,2)):POKES+4,1  
 7:FORD=1TO90\*VAL(MID\$(M\$,LL+2,1)):NEXT  
 440 POKES+4,16:NEXT:GOSUB450:GOSUB460:RE  
 TURN  
 450 FORLL=STOS+23:POKELL,..:NEXT:POKES+24  
 ,15:RETURN  
 460 POKES+6,73:POKES+13,234:POKES+20,234  
 :RETURN  
 470 REM GAME SCREEN  
 480 PRINT"[CLEAR][5"[RIGHT]""] [c 8][RVSON  
 ][5" "][WHITE][c \*]"  
 490 PRINT"[5"[RIGHT]""] [c 8][RVSON] [RVSO  
 FF][3" "][RVSON] [WHITE] [RVSOFF] [GREE  
 N][cEP] [cEP] [3" cEP]" [c 5][RVSON] [c  
 4][c \*][RVSOFF][3" "][c 1][RVSON][s P][  
 s O][s P][s O][s P][s O][s P][s O][s P][  
 s O][s P][c 2][c \*]"  
 500 PRINT"[5"[RIGHT]""] [c 8][RVSON] [RVSO  
 FF][3" "][RVSON] [WHITE] [RVSOFF] [GREEN  
 ][cEP][cEP][c +][cEP][c +][cEP][c +][cEP  
 ][c +][c 5][RVSON] [c 4] [c \*][RVSOFF]  
 [c 1][RVSON][s O][s P][s O][s P][s O][s  
 P][s O][s P][s O][s P][s O][c 2] [c \*]"  
 510 PRINT"[5"[RIGHT]""] [c 8][RVSON] [RVSO  
 FF][3" "][RVSON] [WHITE] [RVSOFF] [GREE  
 N][cEP][c -][c +][cEP][RVSON][c +][RVSO  
 F][c +][RVSON][c +][RVSOFF][cEP][c 5][RV  
 SON] [c 4] [c 8][3" "][c 1][s O][s P][s  
 O][s P][RVSOFF][3" "][RVSON][s P][s O][  
 s P][c 2] "  
 520 PRINT"[RIGHT][RIGHT][c 5][RVSON] [9"  
 [c S]" [c 8][c \*][c 2][RVSOFF][s M][s V  
 ][s V][s N][s M][s V][s V][c 5][RVSON] [c  
 4] [c 8] [c 1][s O][s P][s O][s P][s  
 O][RVSOFF][3" "][RVSON][s O][s P][s P][  
 c 2] "  
 530 PRINT"[RIGHT][RIGHT][c 5][RVSON] [6"  
 [c S]" [RVSOFF][3" "][RVSON] [c 8] [c \*]  
 [c 2][c I] [c \*][sEP] [RVSOFF][s O][c 5]

IE

DJ

EN

KM

KF

MC

EF

PM

MM

MC

DH

PN

GK

KH

DB

CF

PI

LB

AI

HL

[RVSON] [c 4] [c 8] [c 1][s P][s O][s  
 P][s O][s P][RVSOFF][3" "][RVSON][s P][s  
 O][s P][c 2] "  
 540 PRINT"[RIGHT][RIGHT][c 5][RVSON] [6"  
 [c S]" [RVSOFF][3" "][RVSON] [c 8] [RV  
 OFF] [c 2][c \*][RVSON] [RVSOFF][sEP] [c  
 1][RVSON][s P][c 4] [c 8] [c 1][s P][s  
 O][s P][s O][s P][s O][s P][s O][s P][s  
 O][s P][s O][c 2] "  
 550 PRINT"[RIGHT][RIGHT][c 5][RVSON] [6"  
 [c S]" [RVSOFF][3" "][RVSON] [c 8] [RV  
 OFF] [c 2][RVSON][c H][c L][RVSOFF] [c  
 1][RVSON][s O][c 4] [c 1][s O][s P][s O  
 ][s P][s O][s P][s O][s P][s O][s P][s O  
 ][s P][s O][s P][c 2] "  
 560 PRINT"[RIGHT][RIGHT][c 5][RVSON] [9"  
 [c S]" [c 8] [RVSOFF] [c 2][RVSON][c  
 G][c N][RVSOFF] [c 1][RVSON][s P][s O][  
 s P][s O][s P][s O][s P][s O][s P][s O][  
 s P][s O][s P][s O][s P][s O][c 2] "  
 570 PRINT"[RIGHT][GREEN][c -][c 5][RVSON  
 ] [RVSOFF][3" "][RVSON][6" c S]" [c 8]  
 [GREEN][RVSOFF][c -] [c 2][RVSON][s Q][  
 c L][RVSOFF] [c 1][RVSON][s O][s P][s O  
 ][RVSOFF][3" "][RVSON][s O][s P][s O][s  
 P][RVSOFF][3" "][RVSON][s P][s O][s P][c  
 2] "  
 580 PRINT"[GREEN][c -][c -][c 5][RVSON]  
 [RVSOFF][3" "][RVSON][6" c S]" [c 8] [c  
 GREEN][RVSOFF][c -][c -][c 2][RVSON][c H  
 ][c M][RVSOFF] [c 1][RVSON][s P][s O][s  
 P][RVSOFF][3" "][RVSON][s P][s O][s P][  
 s O][RVSOFF][3" "][RVSON][s O][s P][s O]  
 [c 2] "  
 590 PRINT"[GREEN][c -][RVSON][c +][c 5]  
 [RVSOFF][3" "][RVSON][6" c S]" [c 8] [c  
 GREEN][c +][RVSOFF][cEP][c 2][RVSON] [R  
 VSOFF] [c 1][RVSON][s O][s P][s O][RVSO  
 FF][3" "][RVSON][s O][s P][s O][s P][RV  
 OFF][3" "][RVSON][s P][s O][s P][c 2] "  
 600 PRINT"[GREEN][c +][c +][c 5][RVSON]  
 [9" c S]" [c 8] [GREEN][c +][RVSOFF][c  
 +][c 2][RVSON] [c M][RVSOFF] [GREEN][c  
 -][c 1][RVSON][s P][s O][s P][s O][s P][  
 s O][s P][s O][s P][s O][s P][s O][s P][  
 s O][s P][s O][c 2] "  
 610 PRINT"[GREEN][RVSON][c +][RVSOFF][c  
 +][c 5][RVSON] [6" c S]" [RVSOFF][3" "][  
 RVSON] [c 8] [GREEN][RVSOFF][c +][RVSON  
 ][c +][RVSOFF][c +][RVSON][c +][RVSOFF][  
 c -][RVSON][c +][c 1][s O][s P][s O][s P  
 ][s O][s P][s O][s P][s O][s P][s O][s P  
 ][s O][s P][s O][s P][c 2] "  
 620 PRINT"[GREEN][c +][RVSON][c +][c 5]  
 [6" c S]" [RVSOFF][3" "][RVSON] [c 8] [c  
 GREEN][4" c +]" [RVSOFF][c +][RVSON][c +  
 ][c 1][s P][s O][s P][s O][s P][s O][s P  
 ][s O][s P][s O][s P][s O][s P][s O][s P

KC

FA

CC

BB

BD

OO

KN

AD

HN

# IMPORTANT!

Letters on white background are **Bug Repellent** line codes. Do not enter them! Pages 61 and 62 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```
[s 0][c 2] "
.630 PRINT"[GREEN][c +][c +][c 5][RVSON]
[6"[c S]"[RVSOFF][3" "[RVSON] [c 8] [
GREEN][c +][RVSOFF][c +][RVSON][4"[c +]"
][c 1][s 0][s P][s 0][s P][s 0][s P][s 0
][s P][s 0][s P][s 0][s P][s 0][s P][s 0
][s P][c 2] "
.640 PRINT"[c 5]"D$E$B$C$B$C$B$;"[RVSOFF]
[WHITE]GUERRILLA"
.650 PRINT"[c 8]SCORE [WHITE]=[7" "[c 7]
ATTACK [WHITE]1[RIGHT][c 5]AMMO[c 2]"A$A
$A$A$;"[HOME]":RETURN
.660 REM SPRITE LOCATION DATA
.670 DATA96,93,72,61,48,125,96,158,217,12
6,17,126,17,78:REM V+16=64+128
.680 REM SPRITE DATA
.690 DATA1,252,,3,254,,7,199,,7,56,128,6,
221,128,1,125,,
.700 DATA6,21,,4,46,128,4,29,96,12,35,104
,28,62,220,60,62,62
.710 DATA124,56,31,124,54,15,121,45,15,11
4,155,239,4,87,239,10,175,222
.720 DATA19,215,156,32,107,124,193,245,12
0,,,,126,18,15,195,9,23
.730 DATA97,36,63,225,18,63,225,8,51,222,
1,179,128,7,222,180,15,225
.740 DATA110,31,126,223,62,252,191,61,248
,95,1,240,95,126,104,95,185,216
.750 DATA223,85,183,190,147,110,136,16,22
1,240,3,187,240,4,117,80,15,250,80,,
.760 REM INTERRUPT ROUTINE
.770 DATA 120,169,31,141,20,3,169,207,141
,21,3,169,166,141,17
.780 DATA 3,169,207,141,18,3,88,96,173,,2
20,41,15,133,253
.790 DATA 169,15,56,229,253,168,185,221,2
07,240,8,141,168,2,160
.800 DATA 0,32,60,207,76,163,207,173,168,
2,10,170,189,202,207
.810 DATA 8,152,10,170,40,48,25,240,43,17
3,220,207,24,125,0
.820 DATA 208,157,,208,144,31,169,1,77,16
,208,141,16,208,76
.830 DATA 120,207,189,,208,56,237,220,207
,157,,208,176,8,169
.840 DATA 1,77,16,208,141,16,208,173,168,
2,10,170,232,189,202
.850 DATA 207,8,152,10,170,232,40,48,15,2
40,23,173,220,207,24
.860 DATA 125,,208,157,,208,76,162,207,18
9,,208,56,237,220
.870 DATA 207,157,,208,96,76,49,234,173,,
220,41,15,133,253
.880 DATA 169,15,56,229,253,168,185,221,2
07,168,169,,108,5,0
.890 DATA 32,155,183,138,72,32,155,183,10
```

CO  
GM  
EC  
MK  
HG  
LJ  
CD  
IG  
AG  
HA  
EM  
HK  
FH  
JE  
IG  
IN  
LB  
AL  
NJ  
KN  
MI  
AG  
II  
FF  
MF  
CL  
IN

```
4,168,24,76,240,255,0
.900 DATA 0,,255,1,255,1,,1,1,,1,255,1,25
5,0
.910 DATA 255,255,3,,1,5,,7,8,6,,3,2,4
```

MC  
MB  
KF

## TOMB OF HORROR FROM PAGE 48

### BASIC PORTION

```
.10 IFX=.THENX=1:LOAD"TOMB.OBJ",8,1
.20 POKE56,144:POKE55,0:CLR
.30 POKE53280,..:POKE53281,..:X=RND(-TI):FO
RX=901TO970:READA:POKEX,A:NEXT
.40 FORX=828TO839:READA:POKEX,A:NEXT:FORX
=679TO753:READA:POKEX,A:NEXT:GOTO790
.50 D=RND(U)*G:POKES+K,U(D):POKES+7,V(D):
POKES+G,U(D+K+F):POKES+G-U,V(D+K+F)
.60 RETURN
.70 VL=FC:ONFC+UGOSUB450,450,460,470,480
.80 RETURN
.90 ONFC+UGOSUB500,510,520,530:RETURN
.100 ONFC+UGOSUB540,550,560:RETURN
.110 PRINT"[HOME][BLACK][RVSON] +[36" "]/
";
.120 PRINT" [RVSOFF][36"[SS]"[RVSON] "
;
.130 PRINT" [RVSOFF][36"[SS]"[RVSON] "
;
.140 PRINT" [RVSOFF][36"[SS]"[RVSON] "
;
.150 PRINT" [RVSOFF][36"[SS]"[RVSON] "
;
.160 PRINT" [RVSOFF][4"[SS]"[RVSON]
([BLACK][26" "][Z$")([BLACK][RVSOFF][4"[S
S]"[RVSON] ";
.170 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
"Z$"([BLACK][24"="][Z$")([BLACK][SS][RVSO
FF][4"[SS]"[RVSON] ";
.180 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
[SS] +[20" "]/ [SS][SS][RVSOFF][4"[SS]"
[RVSON] ";
.190 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
[SS] [RVSOFF][20"[SS]"[RVSON] [SS][SS]
[RVSOFF][4"[SS]"[RVSON] ";
.200 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
[SS] [RVSOFF][SS][SS]"Z$"[RVSON]([BLACK]
[14"="][Z$")([BLACK][RVSOFF][SS][SS][RV
ON] [SS][SS][RVSOFF][4"[SS]"[RVSON] "
;
.210 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
[SS] [RVSOFF][SS][SS][RVSON][SS]+[12" "
]/[SS][RVSOFF][SS][SS][RVSON] [SS][SS][
RVSOFF][4"[SS]"[RVSON] ";
.220 PRINT" [RVSOFF][4"[SS]"[RVSON][SS]
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSO
F][12"[SS]"[RVSON] [SS][RVSOFF][SS][SS]
```

HH  
BD  
MJ  
AG  
DM  
MK  
DN  
NO  
LJ  
CL  
FG  
AI  
DC  
DM  
FG  
LB  
JF  
BJ  
LO  
PP  
PH

[RVSON] [SS][SS][RVSOFF][4"[SS]"] [RVSON]	FI	•360 PRINTTAB(39-LEN(T\$(DL(CL,U))))T\$(DL(CL,U));:SYSRL:RETURN	EN
•230 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		•370 PRINT"[HOME][RVSOFF][DOWN] ":FORX=.	GC
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSOFF]		TO20:PRINT" ":NEXT:RETURN	
F][SS]"Z\$"[RVSON]<[BLACK][8"="]"Z\$">[BLA		•380 PRINT"[HOME][RVSOFF][7"[DOWN]"]":FOR	FN
CK][RVSOFF][SS][RVSON] [SS][RVSOFF][SS][		X=.TO10:PRINTTAB(8)" ":NEXT:RETURN	
SS][RVSON] [SS][SS][RVSOFF][4"[SS]"] [RV	HF	•390 PRINT"[HOME][RVSOFF][11"[DOWN]"]";TA	EH
SON] ";		B(13)" [DOWN][LEFT]";:FORX=.TOF:PRINT" [	
•240 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		DOWN][LEFT]";:NEXT:RETURN	CE
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSOFF]		•400 PRINT"[HOME][13"[DOWN]"]";TAB(16)" [	PN
F][SS][RVSON][SS] "Z\$"[RVSOFF][c +][4"[c		DOWN][LEFT] [DOWN][LEFT] ":RETURN	AA
Z"]][s *][BLACK][RVSON] [SS][RVSOFF][SS]	NP	•410 PRINT"[HOME][RVSOFF]":FORX=.TO21:PRI	BO
] [RVSON] [SS][RVSOFF][SS][SS][RVSON] [S		NTTAB(39)CHR\$(20)CHR\$(32):NEXT:RETURN	MM
S][SS][RVSOFF][4"[SS]"] [RVSON] ";	FE	•420 PRINT"[HOME][RVSOFF][7"[DOWN]"]":FOR	IO
•250 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		X=.TO10:PRINTTAB(30)" ":NEXT:RETURN	BP
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSOFF]		•430 PRINT"[HOME][10"[DOWN]"]":FORX=.TO5:	PI
F][SS][RVSON][SS] "Z\$"[RVSOFF][PI][BLACK		PRINTTAB(26)" ":NEXT:RETURN	ED
][4" "]" "Z\$"[RVSOFF][c *][BLACK][RVSON] [	EP	•440 PRINT"[HOME][RVSOFF][13"[DOWN]"]";TA	HJ
SS][RVSOFF][SS][RVSON] [SS][RVSOFF][SS][		B(23)" [DOWN][LEFT] [DOWN][LEFT] ":RETUR	MP
SS][RVSON] [SS][SS][RVSOFF][4"[SS]"] [RV		N	IB
SON] ";		•450 PRINT"[HOME][5"[DOWN]"] [RVSOFF]";:FO	JD
•260 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		RX=.TO17:PRINTTAB(6)W1\$:NEXT:RETURN	IH
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSOFF]	JI	•460 PRINT"[HOME][9"[DOWN]"] [RVSOFF]";:FO	MG
F][SS][RVSON][SS] "Z\$"[RVSOFF][PI][BLACK		RX=.TO9:PRINTTAB(12)W2\$:NEXT:RETURN	ON
][4" "]" "Z\$"[RVSOFF][c *][BLACK][RVSON] [		•470 PRINT"[HOME][11"[DOWN]"] [RVSOFF]";:F	FB
SS][RVSOFF][SS][RVSON] [SS][RVSOFF][SS][		ORX=.TO5:PRINTTAB(15)W3\$:NEXT:RETURN	MF
SS][RVSON] [SS][SS][RVSOFF][4"[SS]"] [RV	HB	•480 PRINT"[HOME][13"[DOWN]"] [RVSOFF]";:F	GH
SON] ";		ORX=.TOT:PRINTTAB(17)W4\$:NEXT:RETURN	EI
•270 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		•490 RETURN	OA
[SS] [RVSOFF][SS][SS][RVSON][SS] [RVSOFF]		•500 PRINT"[HOME][23"[DOWN]"] "TAB(13)S1\$;	JA
F][SS]"Z\$"[RVSON]<[BLACK][8" "]" "Z\$">[BLA		:RETURN	JL
CK][RVSOFF][SS][RVSON] [SS][RVSOFF][SS][		•510 PRINT"[HOME][20"[DOWN]"] "TAB(15)S2\$;	JD
SS][RVSON] [SS][SS][RVSOFF][4"[SS]"] [RV		:RETURN	KK
SON] ";	BJ	•520 PRINT"[HOME][17"[DOWN]"] "TAB(17)S3\$;	FB
•280 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		:RETURN	MF
[SS] [RVSOFF][SS][SS][RVSON][SS] / [12" "	IM	•530 PRINT"[HOME][16"[DOWN]"] "TAB(18)S4\$;	GH
] + [SS][RVSOFF][SS][SS][RVSON] [SS][SS][		:RETURN	EI
RVSOFF][4"[SS]"] [RVSON] ";	EX	•540 PRINT"[HOME]"TAB(13)E1\$:RETURN	OA
•290 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		•550 PRINT"[HOME][7"[DOWN]"] "TAB(15)E2\$:R	JA
[SS] [RVSOFF][SS][SS]"Z\$"[RVSON]<[BLACK		ETURN	JL
][14" "]" "Z\$">[BLACK][RVSOFF][SS][SS][RV		•560 PRINT"[HOME][10"[DOWN]"] "TAB(17)E3\$;	JD
SON] [SS][SS][RVSOFF][4"[SS]"] [RVSON] "		:RETURN	KK
;	BP	•570 IF(DL(CL,.)ANDB(F+H))=.THEN610	FB
•300 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		•580 SB=PEEK(V+21):POKEV+21,.:GOSUB2730:G	MF
[SS] / [20" "] + [SS][SS][RVSOFF][4"[SS]"]		OSUB2510:DL(CL,.)=(DL(CL,.)ANDG)	GH
[RVSON] ";	IM	•590 X=INT(RND(U)*10*(DL+U)):C\$(1)="YOU T	EI
•310 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		AKE"+STR\$(X)+" HP DAMAGE!":AA=18:N=1	OA
[SS] / [22" "] + [SS][SS][RVSOFF][4"[SS]"] [R	EX	•600 LF=LF-X:GOSUB2570:GOSUB3120:FORX=.TO	JA
VSON] ";		2000:NEXT:GOSUB2880:POKEV+21,SB	JL
•320 PRINT" [RVSOFF][4"[SS]"] [RVSON][SS]		•610 PRINTD\$TAB(G+H)"MOVE!";:CEM=FNTE(.):	JD
"Z\$"<[BLACK][24" "]" "Z\$">[BLACK][SS][RVSO	BP	POKESE,CEM:GOSUB110:PRINTZ\$;	KK
FF][4"[SS]"] [RVSON] ";		•620 FC=F:VL=FC:LV=CD-U+F*-(CD=U):RV=CD+U	FB
•330 PRINT" [RVSOFF][4"[SS]"] "Z\$"[RVSON]		+F*(CD=F)	
<[BLACK][26" "]" "Z\$">[BLACK][RVSOFF][4"[S	MB	•630 EBM=FNCP(.):IFEBM>.ANDEBM<DETHEN650	
S"] [RVSON] ";	BI	•640 FC=FC-U:ON-(FC>-U)GOTO630:RETURN	
•340 PRINT" / [36" "] + ";	LG	•650 EL=FNCP(LV):ER=FNCP(RV):IFDL(EBM,.)T	
•350 PRINTD\$B\$D\$I\$(DL(CL,T))TAB(G+H)"[WHI		HEN670	
TE]"D\$(CD*-(CU=G))"[c 3]";		•660 GOSUB70:FC=FC-U:ONU-(FC<.)GOTO630,71	

670	IFDL(EL,.)ANDFC<FTHENONFC+UGOSUB370, 380,390,400	CI	980	E3\$="[RVSON][BLACK]>" + LEFT\$(W\$,4) + "< ":CZ\$(.)="[c 4]":CZ\$(1)="[BLUE]":CZ\$(2)= "[c 2]"	HL
680	IFDL(ER,.)ANDFC<FTHENONFC+UGOSUB410, 420,430,440	LJ	990	I\$(.)=LEFT\$(B\$,15):T\$(.)=LEFT\$(B\$,13 )	CM
690	FORD=.TOH:IF(DL(EBM,.)ANDB(D))THENON DGOSUB90,100,70:PRINTZ\$;	AO	1000	DEF FNCP(X)=FC*D(CD)+(CL+D(X)):DEF FNSW(X)=(TGL-CSM)	EP
700	PRINT"[RVSOFF]";:NEXT:FC=FC-U:IFFC>- UTHEN630	HE	1010	DEF FNTE(X)=(TL-CEM):DEF FNCM(X)=X* D(CD)+CL:DEF FNMP(X)=CEM*256+1016+X	OP
710	GOSUB720:CSM=FNSW(.):POKEV+24,(PEEK( V+24)AND15)ORCSM:POKEV+21,EL:RETURN	LD	1020	DEFFNJ(X)=(G-(XANDG)):DEFFNC(X)=(LF <K)*-T+(LF>KANDLF<G)*-(F+H)	JP
720	IFFCANDVLTHENVL=VL-U	ID	1030	DEFFNCD(X)=CD+(CD=F+U)*F+(CD=.)*-F: DEFFNJF(X)=((JYAND(G+U))=.)	DH
730	D=191:POKEFNMP(U),D:POKEFNMP(T),D:PO KEFNMP(H),D:POKEFNMP(F+U),D	MO	1040	DEFFNH(A)=(AR+I(AR)*T+LF/K)	OJ
740	EL=.:ER=.:POKEV+21,.:FORX=VLTO.STEP- U:FC=FNCM(X):IFDL(FC,U)=.THEN780	HK	1050	FORX=.TO15:B(X)=2[UPARROW]X:NEXT X=.TO15:READA:POKEV+X,A:NEXT	KA
750	FC=ABS(DL(FC,U)-U):EL=(ELORSP(X+F))	JH	1060	FORX=.TODE:READD:DL(X,.)=D:NEXT:FOR X=.TO15:READA:POKEV+X,A:NEXT	IP
760	MB=SP(X)-U:FORD=UTOLEN(SB\$(X,FC)):PO KEFNMP(MB+D),ASC(MID\$(SB\$(X,FC),D,U))	OJ	1070	FORX=1TO13:READT\$(X):NEXT:FORX=.TO2 4:READA:M(X)=A:NEXT	IB
770	POKEBC+SP(X)+D,CS(FC):NEXT	BC	1080	FORX=.TO12:READCS(X):NEXTX:FORX=.TO 24:READTS(X):NEXT	CC
780	NEXT:SB=EL:RETURN	HA	1090	FORX=.TO6:FORA=.TO3:SB\$(A,X)=CHR\$(3 2+X):NEXTA,X	EM
790	PRINTCHR\$(147)CHR\$(8)CHR\$(142)"[BLUE ]STAND BY[4".]":GOSUB2900:GOSUB2980	HN	1100	FORX=7TO12:FORA=.TO3:READSB\$(A,X):N EXTA,X	JL
800	DIMDL(383,3),B(15),SP(7),SB\$(3,12),D \$(4),CS(12),L\$(6),I(30),M(24),MH(24)	OG	1110	FORX=.TO1:SB\$(X,.)=CHR\$(191)+CHR\$(3 2):NEXT	BG
810	DIMCM\$(14),T\$(13),I\$(30),C\$(30),C(30 ) ,M\$(44),LV(2,2),CZ\$(2),H(8),SM\$(8)	OE	1120	FORX=1TO30:READI\$(X):NEXT:FORX=1TO1 4:READCM\$(X):NEXT	IP
820	DIMTS(24),U(26),V(26)	KK	1130	FORX=.TO2:FORA=.TO2:READLV(X,A):NEX TA,X:FORX=1TO44:READM\$(X):NEXT	OD
830	FC=.:CL=17:CD=2:VL=.:EL=.:ER=.:VS=.: LF=20:M=.:W=.:005:Z=.94:WL=17	MN	1140	J=1:FORD=.TOT:FORX=.TOK-U	GN
840	TL=388:TGL=16:CSM=.:CEM=192:DE=383:V =53248:SB=.:RL=828:SE=648:SR=679	LP	1150	A=INT(RND(U)*96+(D*128+16)):ON-(DL( A,.)=.)GOTO1150:DL(A,U)=M(J):M(J)=A	CB
850	U=1:T=2:H=3:F=4:K=8:G=15:JOY=56320:D L=.:DM=.:AR=.:CU=.:WE=.	PM	1160	MH(J)=J*F*(D+U):J=J+U:NEXT:NEXT:FOR X=.TO63:POKE61376+X,.:NEXT	FD
860	S=54272:BC=V+38:SS=.:SC=.:CC=55296:S Z=959:I=.	HH	1170	FORD=.TOT:FORX=.TO10	FD
870	D(1)=1:D(2)=16:D(3)=-1:D(4)=-16	LM	1180	A=INT(RND(U)*96+(D*128+16)):ON-(DL( A,.)=.)GOTO1180:DL(A,.)=DL(A,.)ORB(7)	DF
880	H(.)=1:H(1)=10:H(2)=2:H(3)=2:H(4)=1: H(5)=7:H(6)=3:H(7)=13:H(8)=5	DM	1190	NEXT:NEXT	ON
890	SP(.)=.:SP(1)=4:SP(2)=6:SP(3)=7:SP(4 )=15:SP(5)=48:SP(6)=64:SP(7)=128	DJ	1200	FORX=.TO26:A=2703*(2[UPARROW]((X-20 ) / 12)):IFA>65535THENA=65535	LM
900	D\$(.)=" ? ":D\$(1)="EAST ":D\$(2)="S OUTH":D\$(3)="WEST ":D\$(4)="NORTH"	DM	1210	U(X)=INT(A/B(K)):V(X)=A-U(X)*B(K):N EXT	IB
910	SM\$(.)="[EP][EP]":FORX=1TO8:SM\$(X)=C HR\$(32)+CHR\$(32):NEXT:CR\$=CHR\$(13)	AJ	1220	DL(WL,T)=U:DL(WL,H)=U:DL(WL+16,T)=1 0:DL(WL+16,H)=U	MG
920	FORX=.TO38:W\$=W\$+CHR\$(160):B\$=B\$+CHR \$(32):MB\$=MB\$+"*":NEXT	AG	1230	PRINTCHR\$(147)CHR\$(14):POKEV+21,.:P OKEV+23,127:POKEV+29,15	CB
930	D\$="[HOME][c 8][RVSOFF]":FORX=.TO23: D\$=D\$+"[DOWN]":NEXT	ON	1240	POKEV+17,PEEK(V+17)OR64:GOSUB2890:G OSUB610	JB
940	W1\$=LEFT\$(W\$,28):W2\$=LEFT\$(W\$,16):W3 \$=LEFT\$(W\$,10):W4\$=LEFT\$(W\$,6)	LB	1250	SS=144:SC=148:GOSUB2730	IG
950	S1\$="[RVSON][BLACK]" + LEFT\$(W\$,12) + " ":S2\$="[RVSON][BLACK]" + LEFT\$(W\$,8) + "("	GP	1260	C\$(U)=M\$(31):BO\$="[c 4]":MC\$="[WHIT E]":N=U:GOSUB2540:GOSUB2880:GOSUB3050:IT =IT+1000	CM
960	S3\$="[RVSON][BLACK]" + LEFT\$(W\$,4) + "(" ":S4\$="[RVSON][BLACK]" + LEFT\$(W\$,2) + "("	CC	1270	JY=PEEK(JOY):J=FNJ(JY):B=DL(CL,U):I FB>.THENIFRND(U)+B/50>ZTHENGOSUB1590	PJ
970	E1\$="[RVSON][BLACK]>" + LEFT\$(W\$,12) + " <":E2\$="[RVSON][BLACK]>" + LEFT\$(W\$,8) + "<"	FB	1280	ON-(RND(U)>Z)GOSUB50:ON-(FNJF(J)AND	IM

	AR>.)GOSUB1630	PN	•1630 ON-(B=.ORCU=20)GOTO80:E=CL:DM=FNH(.	DD
HL	•1290 IFJTHENONJGOSUB1380,1460,80,1490,80	DK	•1640 ON-(MH(X)=.)GOTO1790:ON-(E<>M(X))GO	AO
CM	,80,80,1500	NO	TO1790:MH(X)=MH(X)-DM:GOSUB3120	IE
EP	•1300 POKEV+K*F,FNC(.):LF=LF+W:ON-(TI>IT)	FP	•1650 FORD=FTOK:WAITV+17,128:POKEV+34,H(D	AF
OP	GOSUB1510:ON-(LF>.)GOTO1270	PN	•1660 ON-(MH(X)>.)GOTO1790:MH(X)=.:DL(E,U	DH
JP	•1310 J=.:D=.:FORX=UTO100:POKE63488+32*K+	AB	•1670 LV=.:A=-U	MG
DH	RND(U)*K,RND(U)*255+U:NEXT	BL	•1680 A=A+U:FC=E+D(A)*LV:IFFC<.ORFC>DETHER	MN
OJ	•1320 PRINT"[BLACK][CLEAR]":POKEV+21,.:GO	FG	N1710	JB
KA	SUB3130:FORX=250TO150STEP-U:SYSSR,.,240,	GP	•1690 IFDL(FC,.)=.ORDL(FC,T)THEN1710	EA
IP	X,.,17,1	DL	•1700 DL(FC,T)=TS(X):DL(FC,H)=U+INT(-(TS(	BG
IB	•1330 NEXT:FORX=.TO7:POKE63488+32*K+X,.:N	NA	X)<G)*RND(U)*H):GOTO1730	DM
CC	EXT:X=.	PA	•1710 IFA=FTHENA=.:LV=LV+U	JF
EM	•1340 POKEV+17,PEEK(V+17)AND191	IE	•1720 GOTO1680	CJ
JL	•1350 C\$(1)=M\$(43+X):C\$(2)="":C\$(3)="[WHI	OK	•1730 FORX=.TOG:FORD=UTOF	JK
BG	TE][5" "]P L A Y[3" "]A G A I N ?[3" "]"	PL	•1740 POKEBC+D,X:NEXT:NEXT:POKEV+21,PEEK(	PB
IP	•1360 BO\$="[RED]":MC\$="[c 3]":N=3:GOSUB25	FL	V+21)AND240	OD
OD	60:GOSUB2520:IFI=UTHEPOKES+24,.:RUN30	HO	•1750 GOSUB3090:LF=LF+B	PE
GN	•1370 POKESE,4:POKE679,.:SYS679	HC	•1760 X=26+RND(U)*5:I(X)=I(X)+INT(RND(U)*	EH
CB	•1380 IFDL(CL+D(CD),.)=.THENGOSUB3120:RET	FN	50*B*(LV+U))	NJ
FD	URN	OH	•1770 C\$(1)="A "+M\$(22+RND(U)*H)+" "+M\$(2	NF
FD	•1390 CL=CL+D(CD):GOSUB570:RETURN	KB	5+RND(U)*H)+" OF "+I\$(X)+". "	AE
DF	•1400 ON-(B>.)GOTO80:SB=PEEK(V+21):SS=144	EL	•1780 BO\$="[YELLOW]":MC\$="[WHITE]":N=U:GO	CN
ON	:SC=148:GOSUB2730	EI	SUB2730:GOSUB2540:GOSUB2880:GOSUB350:RET	CB
LM	•1410 GOSUB2710:POKEV+21,.:GOSUB2740:SS=1	DM	URN	IP
IB	52:SC=156:GOSUB2730	HP	•1790 X=X+U:ON-(X<25)GOTO1640:RETURN	HA
MG	•1420 GOSUB2710:GOSUB2790:ON-(I=G-U)GOTO1	OO	•1800 IFDL(CL,T)=.THENC\$(U)="NOTHING HERE	IC
CB	450	IJ	!":N=U:BO\$="[PURPLE]":MC\$="[WHITE]":GOSU	EK
CB	•1430 ONIGOSUB1800,1850,1930,1940,1950,19	JP	B2540:RETURN	FG
JB	60,2020,2100,2240,2320,2350,2430,2480	FJ	•1810 IFDL(CL,T)>14THEN1830	DI
IG	•1440 SS=152:SC=156:GOSUB2880:GOTO1420	JA	•1820 IFI(DL(CL,T))THENC\$(U)="YOU HAVE A	KE
	•1450 SS=144:SC=148:GOSUB2880:POKEV+21,SB	AD	" +I\$(DL(CL,T)):N=U:GOSUB2540:RETURN	OH
	:X=FRE(.):GOSUB50:RETURN	LP	•1830 I(DL(CL,T))=I(DL(CL,T))+DL(CL,H):C\$(	HC
	•1460 IFFNJF(. )THEN1400	CP	(U)=I\$(DL(CL,T))+ " TAKEN!"	CO
	•1470 IFDL(CL-D(CD),.)=.THENGOSUB3120:RET	OD	•1840 N=U:BO\$="[WHITE]":DL(CL,T)=.:PRINTD	
	URN	JN	\$I\$(.):GOSUB2540:RETURN	
	•1480 CL=CL-D(CD):GOSUB570:RETURN		•1850 IFDL(CL,T)THENC\$(U)="NOT ENOUGH ROO	
	•1490 CD=CD-U:CD=FNCD(.):GOSUB570:RETURN		M HERE.":N=U:BO\$="[PURPLE]":MC\$="[WHITE]	
	•1500 CD=CD+U:CD=FNCD(.):GOSUB570:RETURN		":GOTO2540	
	•1510 D=DL*K+U:J=D+K-U:FORX=DT0J:ON-(MH(X		•1860 GOSUB2580:IFX=-1THENRETURN	
	)=.)GOTO1580:A=-U		•1870 GOSUB2740:GOSUB2790:DL(CL,T)=C(I):D	
	•1520 IFCL<M(X)-KTHENA=M(X)+D(F)		L(CL,H)=I(C(I)):I(C(I))=.	
	•1530 IFCL>M(X)+KTHENA=M(X)+D(T)		•1880 C\$(U)=I\$(C(I))+ " DROPPED.":N=U:BO\$=	
	•1540 IFCL>M(X)ANDCL<M(X)+KTHENA=M(X)+D(U		"[WHITE]":PRINTD\$I\$(C(I));	
	)		•1890 IFAR=C(I)THENAR=.	
	•1550 IFCL<M(X)ANDCL>M(X)-KTHENA=M(X)+D(H		•1900 IFCU=C(I)THENCU=.	
	)		•1910 IFWE=C(I)THENWE=.	
	•1560 IFA<.ORA>DETHEN1580		•1920 GOSUB2540:RETURN	
	•1570 IFDL(A,.)ANDDL(A,U)=.THENDL(A,U)=AB		•1930 GOSUB2630:ON-(N=.)GOTO2530:GOSUB274	
	S(DL(M(X),U)):DL(M(X),U)=.:M(X)=A		0:GOSUB2790:AR=C(I):RETURN	
	•1580 NEXT:ON-(DL(CL,U)>.)GOSUB3030:GOSUB		•1940 GOSUB2670:ON-(N=.)GOTO2530:GOSUB274	
	730:POKEV+21,EL:IT=TI+SZ:RETURN		0:GOSUB2790:CU=C(I):RETURN	
	•1590 IFCU=20THENRETURN		•1950 GOSUB2650:ON-(N=.)GOTO2530:GOSUB274	
	•1600 IFWETHENB=B*((G-WE)/10)		0:GOSUB2790:WE=C(I):RETURN	
	•1610 LF=LF-B*T:GOSUB3120:FORX=.TOH:WAITV		•1960 IF(DL(CL,.)ANDF)=.THENC\$(U)=M\$(29):	
	+17,128:POKEV+34,H(X):POKEV+35,H(X)			
	•1620 NEXT:GOSUB2890:POKEV+K*F,FNC(.):RET			
	URN			

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BO$="[RED]";MC$="[YELLOW]";N=U:GOTO2540 MF
•1970 IFI(19)=.THENC$(U)=M$(30)+I$(19)+"!
":BO$="[PURPLE]";MC$="[CYAN]";N=U:GOTO25
40 EN
•1980 IFI(17)=.THENC$(U)=M$(30)+I$(17)+"!
":BO$="[PURPLE]";MC$="[c 4]";N=U:GOTO254
0 JD
•1990 ON-(CL<>WL)GOTO2010:IFI(25)=.THENC$(
U)=M$(42):BO$="[PURPLE]";MC$="[WHITE]";
N=U:GOTO2540 NC
•2000 PRINTCHR$(147):GOSUB3090:X=U:GOTO13
40 AA
•2010 DL=DL-U:CL=CL-128:A=F:D=50:J=T:GOSU
B3070:GOTO2060 KB
•2020 IF(DL(CL,.)ANDT)=.THENC$(U)=M$(28):
BO$="[RED]";MC$="[YELLOW]";N=U:GOTO2540 EO
•2030 IFI(19)=.THENC$(U)=M$(30)+I$(19)+"!
":BO$="[PURPLE]";MC$="[CYAN]";N=U:GOTO25
40 JB
•2040 IFI(17)=.THENC$(U)=M$(30)+I$(17)+"!
":BO$="[PURPLE]";MC$="[c 4]";N=U:GOTO254
0 GH
•2050 DL=DL+U:CL=CL+128:A=50:D=F:J=-T:GOS
UB3070 NO
•2060 SS=144:SC=148:GOSUB2880:Z$=CZ$(DL):
GOSUB610:GOSUB2890 PN
•2070 GOSUB2710:GOSUB2730:GOSUB2740 FI
•2080 C$(U)=M$(31+DL):BO$="[c 4]";MC$="[W
HITE]";N=U:AA=U:SS=152:SC=156:GOSUB2730 JA
•2090 GOSUB2540:RETURN FN
•2100 PRINTD$B$D$"[YELLOW][RIGHT]"I$(AR)T
AB(17)"[RED]HP[YELLOW]"STR$(INT(LF))TAB(
39-LEN(I$(CU)))I$(CU); LH
•2110 IFWETHENC$(U)=I$(WE):BO$="[c 6]";MC
$="[GREEN]";N=U:AA=19:GOSUB2570 NC
•2120 GOSUB2580:IFX=-UTHENGOSUB350:RETURN BP
•2130 ONIGOTO2140,2140,2170,2170 CN
•2140 GOSUB2740:GOSUB2790:BO$="[WHITE]";C
$(U)="THE "+I$(C(I))+ " IS OF" EN
•2150 C$(T)=M$(18+I(C(I)))+ " WORKMANSHIP.
":AA=K:N=T:LM=28:SM=20-LM/T FO
•2160 GOSUB2740:GOSUB2550:GOSUB350:RETURN LC
•2170 GOSUB2740:GOSUB2790:IFC(I)=16THEN22
00 BF
•2180 C$(U)="YOU HAVE"+STR$(I(C(I)))+ " "+
I$(C(I))+ ". " PC
•2190 N=U:BO$="[WHITE]";GOSUB2540:GOSUB35
0:RETURN GF
•2200 C$(U)="UNROLLING PARCHMENT[3"."]":N
=U:BO$="[YELLOW]";MC$="[c 2]";GOSUB2560 NN
•2210 X=DL*128:J=U:FORA=.TO127STEP16:C$(J
)="":FORD=.TOG LP
•2220 C$(J)=C$(J)+SM$(DL(X+A+D,.)ANDG):NE
XT:C$(J+U)=C$(J):J=J+T FD
•2230 NEXT:N=J-U:BO$="[c 2]";MC$=CZ$(DL):
GOSUB2540:GOSUB350:RETURN PG
•2240 IFCU=.THENC$(U)="YOU ARE EMPTY HAND
ED.":N=U:BO$="[c 8]";MC$="[BLUE]";GOTO25

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40 OF
•2250 IFCU<21THENC$(U)="NOTHING HAPPENS."
:N=U:BO$="[c 4]";MC$="[c 8]";GOTO2540 MD
•2260 C$(U)=M$(15+(CU-21)):N=U:BO$="[YELL
OW]";MC$="[c 3]";GOSUB2560 GO
•2270 IFCU=21ANDDL(CL+D(CD),.)=KTHENDL(CL
+D(CD),.)=U HB
•2280 J=DL(CL+D(CD),U):IFCU=22AND(J=KORJ=
9ORJ=13)THEN2380 FP
•2290 IFCU=23THENCU=.I(23)=.I(24)=U IE
•2300 IFCU=24THENI(25)=U:I(24)=.CU=. ML
•2310 GOSUB2550:RETURN BP
•2320 IFI(18)=.THENC$(U)=M$(34):BO$="[c 7
]";MC$="[PURPLE]";N=U:GOSUB2540:RETURN NG
•2330 I(18)=I(18)-U:LF=LF+10:C$(U)="YOUR
BODY IS FLOODED WITH STRENGTH":N=U PF
•2340 BO$="[c 7]";MC$="[WHITE]";GOSUB2540
:RETURN MC
•2350 J=ABS(DL(CL+D(CD),U)):IFJ=.THENC$(U
)=M$(35):MC$="[YELLOW]";N=U:GOSUB2540:RE
TURN PF
•2360 IFJ<5ORJ=7THENC$(U)="THE IGNORANT B
RUTE IS SILENT.":N=U:BO$="[c 7]";GOTO254
0 LG
•2370 IFLF<B*10ORJ>11ORRND(U)<.8THEN2400 KA
•2380 C$(U)=CHR$(34)+M$(14)+CHR$(34):C$(T
)="MURMURS THE "+T$(J)+ ". " IJ
•2390 BO$="[PURPLE]";MC$="[YELLOW]";N=T:D
L(CL+D(CD),U)=-J:GOSUB2540:RETURN DG
•2400 X=(RND(U)*F):C$(U)=CHR$(34)+"I'LL "
+M$(6+X)+"!!"+CHR$(34) CE
•2410 X=(RND(U)*F):C$(T)=M$(10+X)+" THE "
+T$(J)+ ". " AN
•2420 BO$="[RED]";MC$="[WHITE]";N=T:GOSUB
2540:RETURN IK
•2430 A=.FORFC=.TOH:EBM=FNCP(.):IFEBM<.O
REBM>DETHEN2460 LK
•2440 IF(DL(EBM,.)ANDB(7))=.THEN2460 DF
•2450 DL(EBM,.)=DL(EBM,.)ANDG:GOSUB2510:F
ORX=.TO2000:GOSUB2880:A=A+U LM
•2460 NEXT:IFA=.THENC$(U)="NO TRAPS AHEAD
.":N=U:BO$="[GREEN]";MC$="[WHITE]";GOTO2
540 BF
•2470 C$(U)="YOU AVOID TRAPS.":N=U:BO$="[
RED]";MC$="[WHITE]";GOTO2540 IJ
•2480 A=.FORD=UTOF:ONDGOSUB2630,2650,267
0,2690:IFNTHENA=A+U:GOSUB2740 LC
•2490 NEXT:IFATHENGOSUB2550:RETURN BC
•2500 C$(U)="YOU ARE CARRYING NOTHING.":B
O$="[c 7]";MC$="[WHITE]";N=U:GOTO2540 LF
•2510 C$(U)=M$(36+(RND(U)*6))+ "!!":N=U:BO
$="[c 3]";MC$="[YELLOW]";GOSUB2560:RETUR
N CN
•2520 C$(1)="YEA":C$(2)="NAY":N=2:AA=18:G
OSUB2570:GOSUB2790:RETURN BB
•2530 C$(U)="YOU HAVE NOTHING TO "+CM$(I)
+"!":BO$="[PURPLE]";MC$="[WHITE]";N=U KC
•2540 GOSUB2560:GOSUB2550:RETURN LI

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•2550 JY=PEEK(JOY):J=FNJ(JY):ON-(FNJF(.))	BJ	•2890 POKEV+34,LV(DL,.):POKEV+35,LV(DL,1)	
GOTO2550:WAITJOY,16,16:RETURN	PA	:POKEV+36,LV(DL,2):Z\$=CZ\$(DL):RETURN	FG
•2560 AA=11-(N/T)		•2900 POKE56333,127:POKE1,51:SYS901,53248	LK
•2570 LM=LEN(C\$(U))+F:SM=20-(LM/T):GOSUB2	PE	,55296,61440:SYS901,53248,55296,63488	FN
740:RETURN		•2910 POKE1,55:POKE56333,129	NF
•2580 N=5:FORX=UTON:C\$(X)=M\$(X):C(X)=X:NE	HG	•2920 GOSUB2960:FORX=.TO7:READA:POKE61440	CK
XT:AA=U:SM=11:LM=18:BO\$="[c 5]":MC\$="[c	OK	+87*8+X,A:NEXT	KG
5]"	EB	•2930 POKE56578,PEEK(56578)OR3:POKE56576,	NG
•2590 GOSUB2740:GOSUB2790:IFI=5THENX=-U:R	HG	PEEK(56576)AND252	DM
ETURN		•2940 POKE53272,(PEEK(53272)AND15):POKE64	KE
•2600 ONIGOSUB2630,2650,2670,2690	OK	8,196:PRINTCHR\$(147):POKE648,192	PO
•2610 IFN=.THENC\$(U)="YOU HAVE NO "+C\$(I)	EB	•2950 POKE53272,(PEEK(53272)AND240)OR12:R	CH
+"":N=U:GOSUB2540:X=-U:RETURN	HG	ETURN	MM
•2620 X=U:RETURN	GJ	•2960 READA:IFA=-1THENRETURN	PC
•2630 N=. :FORX=UTOK+U:IFI(X)THENN=N+U:C\$(		•2970 FORX=.TO7:READD:POKE63488+A*8+X,D:N	PF
N)=I\$(X):C(N)=X	JK	EXT:GOTO2960	FL
•2640 NEXT:AA=U:SM=T:LM=18:BO\$="[c 2]":MC	JC	•2980 PRINT"[CLEAR][RVSOFF] [WHITE]A H O	JG
\$="[c 3]":RETURN	MB	Y ! M A G A Z I N E [c 4]PRESENTS[6"[	GB
•2650 N=. :FORX=10TO14:IFI(X)THENN=N+U:C\$(	CD	DOWN]"	DP
N)=I\$(X):C(N)=X	CN	•2990 PRINTTAB(7)"[BLUE]T O M B[3" "]O F[	AI
•2660 NEXT:AA=14:SM=U:LM=18:BO\$="[c 6]":M	EP	3" "]H O R R O R[8"[DOWN]"	JF
C\$="[GREEN]":RETURN	BL	•3000 PRINTTAB(5)"[c 2][DOWN]THE ULTIMATE	PC
•2670 N=. :FORX=15TO24:IFI(X)THENN=N+U:C\$(	JJ	[WHITE]3-D [c 2]ADVENTURE GAME![DOWN]"	MA
N)=I\$(X):C(N)=X	AP	•3010 PRINTTAB(11)"[c 5]JOYSTICK [c 2]IN	EG
•2680 NEXT:AA=U:SM=21:LM=18:BO\$="[c 4]":M	LG	PORT TWO[DOWN]"	HB
C\$="[c 5]":RETURN	AB	•3020 PRINTTAB(6)"(C)1988 [c 5]CLEVELAND	CO
•2690 N=. :FORX=25TO30:IFI(X)THENN=N+U:C\$(	BH	M. BLAKEMORE[DOWN]":RETURN	EG
N)=I\$(X):C(N)=X	AM	•3030 GOSUB3130:POKES+5,K:POKES+6,255:POK	DP
•2700 NEXT:AA=14:SM=22:LM=17:BO\$="[YELLOW	OM	ES+F,23:A=K:D=F:FORX=UTO30:POKES+U,A	AI
]":MC\$="[PURPLE]":RETURN	IF	•3040 POKES+G,D:D=D*1.01:A=A+U:NEXT:POKES	JF
•2710 N=14:FORX=UTON:C\$(X)=CM\$(X):C(X)=X:	AH	+6,G:GOSUB3050:GOSUB350:RETURN	PC
NEXT:AA=T:SM=12:LM=16	JE	•3050 GOSUB3130:POKES+12,F:POKES+19,F:POK	DB
•2720 BO\$="[BLUE]":MC\$="[c 7]":RETURN	IF	ES+13,241	PP
•2730 SYS901,CEM*256,CEM*256+SZ,SS*B(K):S	KF	•3060 POKES+20,241:POKES+11,17:POKES+18,1	FA
YS901,CC,CC+SZ,SC*B(K):RETURN	LK	7:GOSUB50:RETURN	LF
•2740 PRINTCHR\$(19);BO\$;	PC	•3070 FORX=ATODSTEPJ:SYSSR,..,240,X,..,17,1	ON
•2750 FORI=UTOAA:PRINT:NEXT:PRINTTAB(SM)L	EH	5:NEXT:GOSUB3050:RETURN	IL
EFT\$(MB\$,LM):FORI=UTON+T	NK	•3080 SYSSR,..,240,34,75,17,5:GOSUB3050:RE	
•2760 PRINTTAB(SM)"*LEFT\$(B\$,LM-T)*":NE	PF	TURN	
XT:PRINTTAB(SM)LEFT\$(MB\$,LM)	GL	•3090 A\$="251331421502421502":FORX=UTOLEN	
•2770 PRINTCHR\$(19);MC\$"[DOWN]":FORI=UTOA	PK	(A\$)STEPH	
A:PRINT:NEXT		•3100 SYSSR,..,240,VAL(MID\$(A\$,X,T)),..,33,	
•2780 FORI=UTON:PRINTTAB(SM+T);"[RVSOFF]"		10*VAL(MID\$(A\$,X+T,U)):NEXT	
;C\$(I)::NEXT:RETURN		•3110 GOSUB3050:RETURN	
•2790 JY=PEEK(JOY):J=FNJ(JY):ON-(FNJF(.))		•3120 SYSSR,..,240,F,F,129,F:GOSUB3050:RET	
GOTO2790:PRINTCHR\$(19)		URN	
•2800 FORI=UTOAA:PRINT:NEXT:PRINT:I=U		•3130 POKES+24,..:FORRV=.TO24:POKES+RV,..:P	
•2810 PRINTTAB(SM+T);"[WHITE]";C\$(I)		OKES+24,G:NEXT:RETURN	
•2820 JY=PEEK(JOY):J=FNJ(JY):IFFNJF(.))THE		•3140 DATA32,253,174,32,138,173,32,247	
NGOSUB3080:RETURN		•3150 DATA183,132,193,133,194,32,253,174	
•2830 IFJ<>UANDJ<>TTHEN2820		•3160 DATA32,138,173,32,247,183,132,195	
•2840 PRINT"[UP]";TAB(SM+T);MC\$;C\$(I)		•3170 DATA133,196,32,253,174,32,138,173	
•2850 IF(J=T)ANDI<NTHENI=I+U:GOTO2810		•3180 DATA32,247,183,160,..,177,193,145	
•2860 IFJ=UANDI>UTHENPRINT"[UP][UP]";:I=I		•3190 DATA20,165,194,197,196,208,6,165	
-U:GOTO2810		•3200 DATA193,197,195,240,15,230,20,208	
•2870 PRINT"[UP]";:GOTO2810		•3210 DATA2,230,21,230,193,208,2,230	
•2880 SYS901,SS*B(K),SS*B(K)+SZ,CEM*256:S		•3220 DATA194,152,240,225,96,234	
YS901,SC*B(K),SC*B(K)+SZ,CC:RETURN		•3230 DATA162,25,181,217,9,128,149,217,20	

2,16,247,96	IN	9,10,10,10,10,11,11,11,12,13	KH
•3240 DATA32,230,2,169,15,141,24,212,32,2	FD	•3710 DATA 0,,5,9,11,2,5,,13,11,1,5,0	PF
41,183,142,5,212,32,241,183,142		•3720 DATA 18,18,17,2,15,21,19,18,16,3,6,	MC
•3250 DATA6,212,32,241,183,142,1,212,32,2	OE	11,18,4,5,22,8,12,7,13,14,20,18,9,23	
41,183,142,,212,32,241,183,142		•3730 DATA "()" , "()" , "!" , "!" , "!" , "!" , "+" , "+" , "+" , "+" ,	FL
•3260 DATA4,212,32,241,183,134,2,162,10,1	GL	" , "*" , " . / " , " . / " , " _ " , " _ "	
60,255,136,208,253,202,208,248,198	OM	•3740 DATA "12" , "12" , "0" , "0" , "4687" , "45" ,	OE
•3270 DATA2,165,2,208,240,32,230,2,96,160	FK	"3" , "3" , "<=>?" , " ; " , "9" , "9"	
,24,169,,153,24,212,136,208,250,96,0		•3750 DATA DAGGER,HAND AXE,LANCE,MORNING	LK
•3280 DATA0,,,,248,240,232,216,184	OM	STAR,SCIMITAR,BROADSWORD	DD
•3290 DATA28,255,165,165,165,255,165,165,	FD	•3760 DATA WAR HAMMER,DRAGONSLAYER,EXCALI	
255		BUR,BUCKLER,LEATHER JERKIN,CHAINMAIL	AJ
•3300 DATA30,31,31,31,31,31,31,31,31	OM	•3770 DATAIRON PLATE,MITHRIL PLATE,COMPAS	MC
•3310 DATA31,248,248,248,248,248,248,248,	EH	S,SCROLL,STEEL HOOK,PINTS OF ELIXIR	JJ
248	CA	•3780 DATA COIL OF ROPE,BLACK CLOAK,MITHR	PB
•3320 DATA38,,,,,31,15,23,27,29	DC	IL RING,HOLY SYMBOL,LUMP OF COAL	ON
•3330 DATA40,,128,192,224,240,248,252,254	BG	•3790 DATA LUMP OF IRON,ALCHEMY STONE,GEM	HN
•3340 DATA41,,1,3,7,15,31,63,127	CI	S,JEWELS,GOLD,SILVER,RARE SPICES	BH
•3350 DATA42,255,,255,255,255,255,,255	HF	•3800 DATA TAKE,DROP,LEFT HAND,RIGHT HAND	KC
•3360 DATA43,128,64,32,16,8,4,2,1	NE	,ARMOR,ASCEND,DESCEND,EXAMINE,INCANT	NM
•3370 DATA45,,,,,255,255,255,255,255	BE	•3810 DATA QUAFF,HAIL,SEARCH,INVENTORY,EX	OK
•3380 DATA47,1,2,4,8,16,32,64,128	CJ	IT MENU	AN
•3390 DATA60,255,254,252,248,240,224,192,	HA	•3820 DATA 15,12,11,3,14,6,10,8,9	KO
128	GB	•3830 DATA WEAPON,ARMOR,SPECIFIC ITEM,TRE	JG
•3400 DATA61,,,,,,,255	PA	ASURE,EXIT MENU,KNOCK YOU SILLY	LD
•3410 DATA62,255,127,63,31,15,7,3,1,-1	ML	•3840 DATA BASH YOUR BRAINS IN,GRIND YOU	CP
•3420 DATA0,60,126,126,78,78,60,,	PN	TO DOGMEAT,TEAR YOU TO RIBBONS	HK
•3430 DATA ,,,,,,,,,,,,,,	KK	•3850 DATA GROWLS,BELLOWS,BARKS,ROARS,"PA	BI
•3440 DATA ,.4,1,1,1,1,1,1,,1,1,1,,	IG	SS BY, KNIGHT ERRANT"	
•3450 DATA ,.1,1,1,1,1,1,1,,,,,1,,	KM	•3860 DATA A SPRAY OF WHITE LIGHT,A CHORU	
•3460 DATA ,.1,1,1,1,1,1,1,1,1,1,1,,	OO	S OF ANGELIC VOICES	
•3470 DATA ,.1,1,1,1,1,1,1,1,1,1,1,,	DO	•3870 DATA IT TRANSFORMS IN YOUR HAND!,A	
•3480 DATA ,,,1,1,1,1,1,1,1,1,1,1,1,,	GA	BLAST OF SPARKS..CHECK INVENTORY	
•3490 DATA ,.1,1,1,1,1,1,1,2,1,1,1,1,,	PJ	•3880 DATA COMMON,GOOD,EXCELLENT,PRECIOUS	
•3500 DATA ,,,,,,,,,,,,,,	GB	,GLITTERING,FABULOUS,CACHE,CHEST,CRATE	
•3510 DATA ,,,,,,,,,,,,,,	JE	•3890 DATA NO SHAFT LEADING DOWN HERE,NO	
•3520 DATA ,.2,1,1,1,1,1,1,1,1,1,1,1,,	JF	SHAFT LEADING UP HERE	
•3530 DATA ,,,1,1,1,1,1,1,1,1,1,1,,	PD	•3900 DATA"YOU DON'T HAVE THE ",THE CATAC	
•3540 DATA ,.1,1,1,1,1,1,1,1,1,1,1,1,,	FJ	OMBS,THE SEPULCHRE	
•3550 DATA ,,,1,1,1,1,1,1,1,1,1,1,,	KO	•3910 DATA THE BARROW,YOU'RE OUT OF HEALI	
•3560 DATA ,.1,1,1,1,1,1,1,1,1,1,1,1,,	JN	NG ELIXIR,YOUR VOICE ECHOES EMPTY	
•3570 DATA ,.1,,,1,1,1,1,1,1,1,,2,,	KM	•3920 DATA POISON DARTS,TRIPWIRE,BEAR TRA	
•3580 DATA ,,,,,,,,,,,,,,	PL	P,SPIKED PITFALL,TRAPDOOR,SNARE NOOSE	
•3590 DATA ,,,,,,,,,,,,,,	MO	•3930 DATA YOU DO NOT HAVE THE ALCHEMY ST	
•3600 DATA ,.4,1,8,1,1,1,1,1,,1,1,8,1,1,,	DB	ONE!,T H O U A R T S L A I N !	
•3610 DATA ,.1,1,1,,1,1,1,1,1,,8,1,,	IA	•3940 DATATHOU HAST CONQUERED THE TOMB!	
•3620 DATA ,.1,1,1,,1,1,1,1,1,,8,1,1,,	AC		
•3630 DATA ,.8,1,1,8,1,1,1,1,1,1,1,1,1,,	NL		
•3640 DATA ,.1,1,1,,1,1,1,1,1,,1,1,,	HI		
•3650 DATA ,.1,,8,1,1,1,1,,1,1,1,1,,4,,	OP		
•3660 DATA ,,,,,,,,,,,,,,	IJ		
•3670 DATA160,194,160,152,137,110,185,110			
,170,170,170,129,172,150,172,160			
•3680 DATASTIRGES,GIANT SPIDER,CONSTRICTO			
R,GRAVE RAT,DROW ELF,HOBGOBLIN,FUNGUS			
•3690 DATALICH PALADIN,SPECTER,REVENANT,W			
YVERN,GUARDIAN NAGA,DEMON KING			
•3700 DATA 1,1,2,2,3,3,4,4,5,6,6,7,7,8,8,			

## TOMB.OBJ

Starting address in hex: C800

Ending address in hex: CFFF

Flankspeed required for entry! See page 63.

C800: 08 40 00 1C E0 00 23 10 78  
C808: 00 04 82 10 00 07 38 00 DD  
C810: 08 C4 00 01 20 00 00 00 FD  
C818: 00 00 00 01 08 00 03 9C C0  
C820: 00 04 62 00 00 90 00 00 17  
C828: 00 00 00 00 84 00 01 CE 7C

KH	C830:	21	02	31	73	80	48	8C	40	8D	CA00:	F8	44	1E	CB	BB	8E	63	FF	D4
PF	C838:	00	12	00	00	00	00	00	00	4A	CA08:	9F	3B	FF	86	03	FF	86	03	F5
MC	C840:	00	00	00	00	00	00	00	00	40	CA10:	FF	86	03	FF	86	03	FF	86	A9
FL	C848:	00	00	00	00	00	00	00	00	48	CA18:	03	FF	86	03	FF	86	03	FF	2E
OE	C850:	00	00	00	00	00	02	00	40	92	CA20:	86	03	FF	86	03	FF	82	03	B8
LK	C858:	25	3C	A4	54	FF	2A	8D	FF	6A	CA28:	FF	80	03	FF	80	07	FF	C0	F3
DD	C860:	B1	97	FF	E1	9B	FF	D1	FF	F8	CA30:	07	FF	C0	0F	FF	E0	1F	FF	07
AJ	C868:	FF	FF	DB	DD	D3	D8	FF	93	62	CA38:	F0	7D	FF	78	F0	E6	1F	FF	16
MC	C870:	48	C1	92	48	41	12	44	22	0F	CA40:	00	10	00	00	10	00	00	92	F2
JJ	C878:	22	40	00	02	20	00	04	00	01	CA48:	00	00	BA	00	00	BA	00	00	BD
PB	C880:	00	00	00	00	00	00	00	00	80	CA50:	FE	00	00	92	00	00	D6	00	B8
ON	C888:	00	00	F8	00	01	FC	00	02	81	CA58:	00	EE	00	01	EF	00	0E	EE	35
HN	C890:	AA	00	02	72	00	02	02	00	B3	CA60:	C0	1F	7D	F0	3F	AB	F8	3F	D1
BH	C898:	01	04	00	00	88	00	00	70	96	CA68:	D7	FC	7F	D7	FC	7F	EF	FC	FD
KC	C8A0:	20	00	70	40	00	70	40	00	22	CA70:	F7	FF	DC	F3	FF	9E	F3	FF	CB
NM	C8A8:	70	60	00	78	30	00	3C	1C	7A	CA78:	9E	E3	BB	8E	E3	C7	8E	00	7F
OK	C8B0:	00	1E	0E	00	3C	3C	00	78	CD	CA80:	00	78	00	00	84	00	01	4A	C8
AN	C8B8:	F0	00	3F	E0	00	1F	C0	00	A9	CA88:	10	01	02	28	03	87	28	05	7B
KO	C8C0:	00	00	00	38	FF	00	43	FF	3C	CA90:	86	90	0E	CD	90	1F	7B	D0	7F
JG	C8C8:	C0	37	FF	E0	0F	FF	F0	0F	B0	CA98:	3D	B7	F8	3D	CF	E4	29	B7	59
LD	C8D0:	FF	F0	0F	FF	F0	0E	FF	B0	80	CAA0:	64	29	CF	2C	29	FF	38	1A	A5
CP	C8D8:	0E	7F	30	1E	BE	B8	3E	DD	48	CAA8:	01	18	03	CF	00	03	B7	00	4F
HK	C8E0:	BC	7F	6B	7E	FC	FF	9F	78	1C	CAB0:	07	CF	00	05	7A	80	0B	EF	82
HF	C8E8:	DD	8F	78	49	07	38	7F	03	D9	CAB8:	80	0D	7B	40	0D	56	C0	DC	03
BI	C8F0:	18	5D	03	0C	08	1E	1E	00	B9	CAC0:	03	E7	C0	07	DB	E0	07	BD	F4
DBJ	C8F8:	2F	35	00	0A	55	00	14	00	D0	CAC8:	E0	0F	DB	E0	0F	E7	F0	0F	6C
	C900:	04	00	40	0C	7C	60	12	BA	F9	CAD0:	FF	F0	0F	FF	F0	0F	FF	F0	C1
	C908:	90	11	93	10	09	FF	20	07	7D	CAD8:	0F	FF	F0	0F	FF	F0	0F	FF	E7
	C910:	BB	C0	01	C7	00	1F	7D	E0	D2	CAE0:	F0	0F	FF	F0	1F	FF	F8	1F	09
	C918:	3F	83	F0	F3	FF	7C	A1	7A	58	CAE8:	FF	F8	1F	7F	D8	3D	EF	7C	03
	C920:	1E	C0	FC	05	C3	FE	03	C7	8E	CAF0:	2F	BF	EC	3A	FA	AC	2D	95	71
	C928:	CF	03	CE	03	83	CE	01	C6	E6	CAF8:	F6	5F	56	AE	A4	DD	CA	66	08
	C930:	F7	01	EE	E3	87	FC	D1	E6	39	CB00:	00	F8	00	01	04	00	02	02	02
	C938:	5C	68	67	6A	13	E0	10	04	D6	CB08:	00	02	8A	00	02	02	00	02	9A
	C940:	34	42	0F	18	66	1F	2C	5A	E9	CB10:	02	00	02	03	06	03	07	09	30
	C948:	21	06	66	01	03	5A	01	07	3C	CB18:	03	8F	09	03	DF	09	0D	FE	AB
	C950:	BD	E3	0B	DB	D3	15	E7	AF	59	CB20:	C6	1E	FD	E6	3F	7B	F6	7F	1B
	C958:	2E	E7	77	59	7E	BD	71	DB	C8	CB28:	B7	FF	BF	CF	F7	DF	B7	FA	F9
	C960:	99	60	A5	01	71	99	81	6B	F8	CB30:	9F	CF	F2	9F	FF	F2	97	FF	BC
	C968:	7E	C1	66	C3	61	25	81	A1	7C	CB38:	D2	67	FF	CC	02	00	40	E7	69
	C970:	0F	00	F1	0F	00	F1	0A	00	7C	CB40:	00	3C	00	00	7E	02	00	42	3F
	C978:	51	0E	00	71	3A	00	5C	DC	BC	CB48:	02	00	66	02	00	66	02	3D	58
	C980:	00	78	0C	70	FC	12	89	FE	0D	CB50:	BD	82	67	BD	C2	77	FF	E2	D2
	C988:	31	C1	FF	64	63	F1	C2	32	2A	CB58:	43	DB	E2	5A	FF	77	7E	66	11
	C990:	64	C6	64	2A	6C	CC	AA	66	94	CB60:	3F	7E	5A	1E	3C	FF	00	01	D3
	C998:	DC	24	E3	7E	71	E3	3F	FF	90	CB68:	7E	80	03	FF	C0	07	81	E0	94
	C9A0:	E6	3E	BA	FC	1C	82	7A	58	EE	CB70:	0F	00	F0	0E	00	70	0E	00	FC
	C9A8:	00	31	8C	44	79	87	45	FB	EC	CB78:	70	0E	00	70	3E	00	7C	1E	40
	C9B0:	CF	FF	FE	7F	FF	FE	3F	FF	3D	CB80:	F9	BD	8F	70	FF	06	01	FF	3F
	C9B8:	FE	7F	FF	FF	FF	FF	04	3B		CB88:	80	01	FF	80	01	FF	80	03	0F
	C9C0:	00	10	00	00	54	00	00	7C	A1	CB90:	7E	C0	06	FF	60	0F	FF	F0	36
	C9C8:	00	00	54	00	00	6C	00	00	89	CB98:	1F	FF	F8	1F	81	F8	1F	00	69
	C9D0:	6C	00	01	7D	00	03	AB	80	EA	CBA0:	F8	1E	00	78	1E	00	78	1E	E4
	C9D8:	07	D7	C0	0F	EF	E0	0D	FF	65	CBA8:	00	78	1E	00	78	1E	00	78	4E
	C9E0:	60	0C	FE	30	0E	D6	78	0C	E5	CBB0:	1E	00	78	1E	00	78	1E	00	FB
	C9E8:	6C	10	06	D6	10	00	FE	10	61	CBB8:	78	3E	00	7C	FE	00	7F	FE	69
	C9F0:	00	FE	10	00	FE	10	00	FE	0E	CBC0:	00	00	00	00	00	00	00	00	C0
	C9F8:	10	01	FF	00	07	FF	C0	06	D7	CBC8:	00	00	7E	00	00	FF	00	00	47

CBD0:	81	00	00	81	02	00	E7	02	BF	CDA0:	40	02	DB	40	03	BD	C0	03	83
CBD8:	00	E7	02	00	E7	02	73	7E	9E	CDA8:	DB	C0	02	BD	40	03	DB	C0	E4
CBE0:	C2	FF	7E	E2	8D	7E	E2	CF	C3	CDB0:	02	BD	40	02	DB	40	03	E7	B9
CBE8:	7E	F2	85	FF	F2	B7	BD	FA	43	CDB8:	C0	03	FF	C0	03	FF	C0	01	02
CBF0:	B5	BD	FA	B7	FF	FA	FD	FF	10	CDC0:	7F	00	00	FE	80	00	FB	40	FB
CBF8:	FA	FD	E7	BA	FD	81	BF	F8	CC	CDC8:	00	F3	20	00	E6	D0	00	FD	92
CC00:	10	B0	10	39	6E	38	38	F9	E2	CDD0:	A8	00	EB	D4	00	FB	EA	00	21
CC08:	38	38	F0	78	3C	F8	78	36	C5	CDD8:	07	EA	00	CF	EA	00	DF	DA	40
CC10:	76	58	3B	38	B8	3D	FF	78	C0	CDE0:	00	FF	B4	00	FF	68	00	00	FD
CC18:	3D	7F	B8	3D	B7	18	3A	CB	A0	CDE8:	D0	00	FD	A0	00	03	40	00	9B
CC20:	38	19	77	D8	08	8F	10	00	69	CDF0:	FC	80	00	FB	00	00	FA	00	65
CC28:	FF	00	82	BD	40	47	C3	C0	74	CDF8:	00	D4	00	00	D4	00	00	DC	7F
CC30:	4F	BD	C0	9B	C3	C0	B3	3C	0E	CE00:	00	00	FE	00	01	7F	00	02	81
CC38:	C0	67	81	E0	0A	81	50	00	9E	CE08:	DF	00	04	CF	00	0B	67	00	2E
CC40:	77	FF	F7	33	FF	E6	12	FF	DB	CE10:	15	BF	00	2B	D7	00	57	DF	1F
CC48:	AC	01	7F	40	01	7F	40	01	77	CE18:	00	57	E0	00	57	F3	00	5B	F6
CC50:	36	40	01	41	40	03	77	60	24	CE20:	FB	00	2D	FF	00	16	FF	00	5F
CC58:	03	7F	60	47	36	70	2B	41	95	CE28:	0B	00	00	05	BF	00	02	C0	BA
CC60:	6C	4D	77	5E	9D	7F	7E	9D	29	CE30:	00	01	3F	00	00	DF	00	00	50
CC68:	36	5E	9D	41	5C	AD	77	5C	B9	CE38:	5F	00	00	2B	00	00	2B	DC	CA
CC70:	AD	7F	6C	AD	80	DC	F6	FF	0C	CE40:	1C	00	70	3E	00	F8	3F	6D	B0
CC78:	90	CF	00	3C	14	80	4A	00	F3	CE48:	F8	3F	C7	F8	3F	FF	F8	3B	B4
CC80:	03	7C	00	09	E7	E0	27	FF	F8	CE50:	BB	B8	31	93	18	23	6D	C8	FA
CC88:	C4	73	F9	4E	F3	D8	1F	F3	E8	CE58:	07	A9	E0	0D	BA	E0	0C	C2	61
CC90:	DC	1F	F9	ED	1F	FC	F7	9F	28	CE60:	60	0E	7D	C0	07	FA	80	01	90
CC98:	FE	70	37	F7	78	6F	FB	BE	D9	CE68:	BA	80	00	FD	40	00	EE	00	D0
CCA0:	DF	FD	FF	BF	F6	FF	7F	EF	A4	CE70:	01	C7	00	01	C3	80	00	C3	42
CCA8:	FF	DF	EE	FB	E3	EE	F7	6D	AB	CE78:	80	00	C3	00	03	42	C0	00	C2
CCB0:	EE	70	65	ED	86	A9	EF	FC	80	CE80:	E3	FF	DE	E1	F5	C6	C1	FA	9E
CCB8:	6D	E7	81	EF	F8	3F	EF	F0	98	CE88:	FF	BA	F5	C7	7F	75	41	05	3C
CCC0:	00	FC	00	01	7A	00	03	B7	F3	CE90:	BA	C0	04	BF	C0	09	7F	F0	0A
CCC8:	00	03	CF	00	01	FE	00	00	9B	CE98:	00	F0	F0	01	E0	70	03	C0	90
CCD0:	FC	00	00	78	00	00	78	00	BE	CEA0:	F0	03	C0	F0	03	C0	E0	01	EB
CCD8:	00	78	00	00	78	00	00	78	42	CEA8:	C1	C0	01	C3	80	01	C3	80	B5
CCE0:	00	00	78	00	00	78	40	00	12	CEB0:	01	C3	80	03	C1	C0	03	C1	40
CCE8:	78	20	00	78	20	00	FC	60	77	CEB8:	E0	07	C1	F0	1D	22	5C	00	EE
CCF0:	01	FF	C0	0F	00	E0	1F	FF	C1	CEC0:	60	00	1C	F0	00	1E	F8	00	45
CCF8:	F0	18	03	F0	0F	FF	E0	DD	C3	CEC8:	3F	F8	00	3F	FC	C6	7F	EE	72
CD00:	03	BD	C0	03	DB	C0	02	BD	E0	CED0:	83	7F	ED	83	AF	ED	C3	AF	56
CD08:	42	02	DB	44	03	BD	C6	03	F6	CED8:	ED	FF	AF	EF	7E	EF	F7	3C	09
CD10:	DB	C3	03	BD	C3	02	DB	C7	D9	CEE0:	DF	73	99	8E	22	FF	44	0C	CE
CD18:	05	E7	CF	0B	FF	CE	17	FF	C5	CEE8:	EB	30	1F	6B	78	7F	BE	F8	3F
CD20:	DC	2F	FF	DC	5F	FF	DC	5F	A4	CEF0:	77	DD	F8	E5	E3	B8	C2	FF	84
CD28:	FF	BE	7F	FF	7E	7F	FE	FE	62	CEF8:	5C	C3	18	CE	E1	FF	8E	00	70
CD30:	7F	FE	FE	7F	FE	FE	3F	FF	6A	CF00:	0F	F0	FE	0F	E0	FE	0F	C0	BD
CD38:	7C	1F	FF	F8	07	FF	F0	1C	E0	CF08:	7E	0F	C0	7E	1F	80	3E	1F	D1
CD40:	07	E7	E0	0B	7E	D0	15	3C	BB	CF10:	00	3E	1F	00	7E	1F	00	FC	08
CD48:	A8	2E	FF	74	5F	7E	FA	5F	CB	CF18:	3F	00	F8	3F	01	F8	3F	01	C9
CD50:	81	FA	5F	BD	FA	2F	FF	F4	09	CF20:	F0	1F	01	F0	1F	03	E0	0F	34
CD58:	14	FF	28	0B	00	D0	04	FF	74	CF28:	03	E0	0F	47	C0	07	87	C0	72
CD60:	20	03	81	C0	02	E7	40	03	F2	CF30:	03	87	C0	03	87	80	07	87	15
CD68:	99	C0	03	DB	C0	02	BD	40	62	CF38:	C0	0A	C7	60	14	8A	90	FC	57
CD70:	02	DB	40	03	BD	C0	02	DB	ED	CF40:	7F	BF	7E	FB	C0	EF	FB	F7	9E
CD78:	40	02	BD	40	03	DB	C0	00	58	CF48:	EF	FB	F7	EF	FD	FF	EF	F6	01
CD80:	03	FF	C0	03	FF	C0	03	DB	E6	CF50:	0C	1F	F7	FF	EF	F3	FC	6F	C3
CD88:	C0	03	BD	C0	02	DB	40	02	EA	CF58:	F0	7B	AF	E3	B7	E7	EF	D7	BF
CD90:	BD	40	03	DB	C0	03	BD	C0	AF	CF60:	37	FF	B5	3F	FC	B4	9F	79	57
CD98:	03	DB	C0	03	DB	C0	02	BD	97	CF68:	5A	EF	31	39	E0	01	FF	E0	DF

CF70: 03 FF E0 03 FF F0 03 FF 4B	CFB8: 3D 38 3F DD 10 1F EF FC 67
CF78: F8 07 E1 FC 0F E0 FE FC 43	CFC0: 00 01 E0 00 07 F0 0C 0F B5
CF80: 07 80 00 0F E0 00 1F F0 08	CFC8: F8 07 0F FC 03 9F FE 03 79
CF88: 30 3F F0 E0 7F F9 C0 FF 04	CFD0: BF FF 03 BF FF F7 BB FF 07
CF90: FD C0 FF FD C0 FF DD EF DB	CFD8: FF BB FF FF 7B FF FD 7D 8B
CF98: FF DD FF FF DE FF FF BE 14	CFE0: FF F9 BD FF F1 DD FF C3 2C
CFA0: BF FF BD 9F FF BB 8F FF 09	CFE8: DD FF FF D3 FF FF C9 FF 64
CFA8: BB C3 FF CB FF FF 93 FF 87	CFF0: FF D8 FF FF A8 7F BC 7C 2B
CFB0: FF 1B FF FE 15 FF 7C 3E 9A	CFF8: 3E BB FC 1C F7 F8 08 FC 02

## SCUTTLEBUTT

Continued from page 12

plus free shipping.

P.A.V.Y. Software, 314-527-4505 (see address list, page 12).

## AI TYPING TUTOR

*Mavis Beacon Teaches Typing* by use of artificial intelligence, checking the student's progress every step of the way and tailoring an individualized course of study. Mistakes are explained in conversational sentences, rather than by bleeps and bells. Customized practice lessons include literary quotes, riddles, and facts from the Guinness Book of World Records. Other features are a Road Racer typing game, and musical "tempo typing" with onscreen metronome. Over 20 different graphs display the student's progress. \$39.95 for the C-64; \$44.95 for the Amiga.



A practice screen from Mavis Beacon.  
**READER SERVICE NO. 178**

The Software Toolworks, 818-907-6789 (see address list, page 12).

## UNSILENCED

MicroProse's *Silent Service* is again on sale in West Germany after a government agency in Bonn rescinded a 14-month old prohibition. The WWII submarine simulation had been judged

potentially harmful to youth. But MicroProse called into question the agency's criteria for determining the product harmful, and contended that banning sales to youth effectively banned sales to adults too, since the product could under those circumstances not be advertised, or sold except in stores with adults-only entrances. The ban was lifted less than 24 hours before a scheduled hearing.

With the matter settled, there's little need for editorializing—but we applaud the West German government for overturning its earlier decision. The events of 50 years ago are understandably not a source of national pride for modern-day Germans. But there's more to be gained by studying and understanding the past than by attempting to strike it from the record.

MicroProse, 301-771-1151 (see address list, page 12).

## REVIEWS

Continued from page 56

tem that would not require a customer to wait while you swapped disks and entered most information twice.

With those caveats, we'll go on to say that the documentation, though slight, is adequate, and that most people should find the system easy to use. Much of this is due to onscreen prompts and messages that will lead you through each step of the transaction, many of them highlighted by flashing graphics that are designed to recapture wandering attention spans.

System requirements for using *TI-SAR 128*—with no deviations tolerated—are a C-128 or C-128D, a 1571 drive, and an 80-column monitor with color preferred. All disks in the system are copyable so that you can keep originals in a safe place, and each program has a "disk-doctor" to help retrieve information lost due to accidents.

CW Data Labs, 1632 Napfle Avenue,

Philadelphia, PA 19111.—*Ervin Bobo*

## WARPSPEED!

**CinemaWare**

**Commodore 64/128**

**Cartridge; \$49.95**

The Commodore 64/128 has many virtues. Processing speed is not among them. Once, a computer magazine even printed a list of things for Commodore users to do while waiting for a program to load from disk.

Several manufacturers have attempted to address this annoying shortcoming with "speed up" cartridges. *Mach-5* and *Mach-128* (Access) and *Fast Load* (Epyx) are probably the best known.

Now Cinemaware has entered the field with what may prove to be the most powerful and versatile accelerator cart on the market. Though the company earned its reputation with entertainment products like *Defender of the Crown* and *King of Chicago*, skeptics will quickly become converts once they try this amazing booster box.

Like all existing accelerator units, *Warpspeed!* plugs into the Commodore's cartridge slot. It has a mode switch to select either 64 or 128 and a recessed reset button.

*Warpspeed!* conveniently supports the *Fast Load* command structure, including the two-key (RUN STOP and COMMODORE) combination, which eliminates typing information to load a program. It loads, saves, and formats disks up to 10 times faster than normal. A few disks, like the Quantum-Link terminal program, won't load with *Warpspeed!*, but most do.

The copy features of this menu-driven cartridge are even more impressive. It duplicates disks and files up to 40 times faster. The user can even pick several files from the same disk and copy or scratch them in one operation.

*Warpspeed!* supports both double- and single-sided drives, including the 1581 and MSD units. It copies files between single- and double-sided disks and enables the 1571 to function in dou-

ble-sided mode on the C-64.

Cinemaware's cartridge is also packed with goodies for programmers and "serious" users. *Warspeed!* boasts its own mini-assembler and built-in machine language monitor. These functions, which work in disk drive memory, include the ability to "smart move" code up and down in RAM. The cartridge allows relocated loads and saves, verifies disk files from inside the monitor, can redirect output to the printer,

loads/saves disassembles under ROMs and I/O (\$d000), and incorporates an extended DOS wedge.

The machine language monitor and mini-assembler interface with the sector editor also contained in *Warspeed!*. It edits in hex or normal ASCII text and traces directory and file track and sector links.

That may sound like a lot of features in a small package, but these are only the high spots. *Warspeed!* has over 30

tools for casual and advanced users. Alien Technologies, a British-based development company, has clearly tried to create the ultimate accelerator cartridge. Future products may topple the new king of the speed carts from its throne, but right now, *Warspeed!* is an indispensable aid for every Commodore computer owner.

Cinemaware, 4165 Thousand Oaks Blvd., Westlake Village, CA 91362 (phone: 805-495-6515). —*Arnie Katz*

## TIPS AHoy!

*Continued from page 44*

```
•110 POKE R,255-PEEK(R):NEXT
•120 POKE 4588,56:CHAR,0,0,"[c T][c I][c
P][c S][SS][c A][c H][c O][c Y][cEP]"
•130 POKE 2604,30:WINDOW 0,0,39,24,1
•140 FOR A=160 TO 191:X$=X$+CHR$(A):NEXT
•150 SYS DEC("CC6C"),,18,4:PRINT X$:A=179
1+RND(0)
•160 CHAR ,4,2,X$:BOX 1,30-B,30-B,289+B,9
8+B
•170 A=A+1:X=SIN(A/2)*1.9+2:Y=COS(A/[PI])
*1.9+2
•180 CIRCLE 1,91,164,X,Y,,,30:CHAR ,0,20
,"+"
•190 CHAR ,4+(AAND31),4+(7ANDA/32),"+"
•200 CIRCLE 0,91,164,X,Y,,,30
•210 GET A$:IF A$="" THEN 170
•220 FORA=14592TO14599:POKEA,0:NEXT
•230 FOR A=0 TO 13:CHAR ,0,A,"[40" "]:NE
XT
•240 GRAPHIC0:LIST
```

### PROGRAM PAUSER

Most of us have heard of and used program pausers. With the press of a key, the list or execution of a program is stopped in its binary tracks, until another key is pressed. *Program Pauser* takes this a step forward.

Load *Program Pauser* and change the variable PSWD\$ to a secret code. (The default is "AHoy!") Run the program. Then, when you wish to pause your 128, press CONTROL and the up arrow key. The computer will pause. To restart the computer on its merry way, press RETURN, the

secret code, and RETURN.

—Shawn K. Smith  
Bronx, NY

```
•100 REM PROGRAM PAUSER -- SHAWN K. SMITH
•110 FORD=6912TO6999:READY:POKE,Y:NEXT
•120 PSWD$="AHoy!":L=LEN(PSWD$)-1
•130 POKE6955,L:POKE6976,L:FORD=DTOD+L
•140 POKED,ASC(MID$(PSWD$,L+1-P,1))
•150 P=P+1:NEXT:END
•200 DATA 169,023,141,060,003,169,027,141
•210 DATA 061,003,096,169,173,162,198,141
•220 DATA 060,003,142,061,003,096,234,201
•230 DATA 094,240,003,076,173,198,032,011
•240 DATA 027,173,004,010,041,254,141,004
•250 DATA 010,234,160,002,132,251,032,228
•260 DATA 255,240,251,201,013,240,243,164
•270 DATA 251,153,093,027,136,016,237,160
•280 DATA 002,185,088,027,217,093,027,208
•290 DATA 225,136,016,245,173,004,010,009
•300 DATA 001,141,004,010,076,000,027,234
```

### PRETZEL

Here's a quick and easy demo of the power of C-128 graphics and basic trigonometry. Try changing COLOR2 and COLOR3, increment of "P", draw coords, and trig formulae. Add a "DRAW1..." statement for a third color. Or "stack" drawings by changing "GRAPHIC3,1" to "GRAPHIC3,0" and changing other aspects after your first run. The possibilities are truly endless....

—William D. Wolfe  
Pittsburgh, PA

```
10 WIDTH2:COLOR0,1:COLOR4,1:GRAPHIC3,1:D
0:P=P+.01:X=60*COS(P*3)+68:Y=60*COS(P*4)
+105:DRAW3,X+22,YTOX,Y-9:DRAW2TOX,Y:LOOP
```

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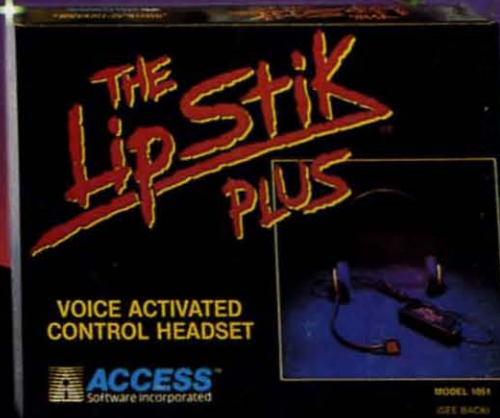
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